

TURN TO DESK

The Refrigeration Service Engineer

Vol. 7
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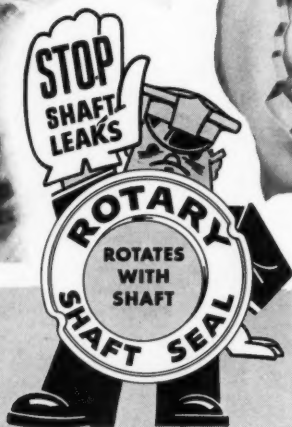
In This Issue—

**Building a Refrigeration Analyzer
Servicing G. E. Hermetics
Questions and Answers**



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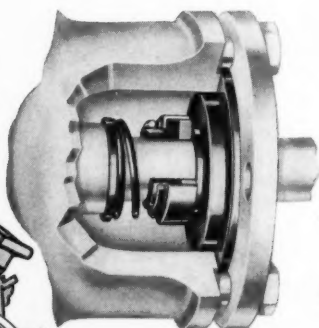


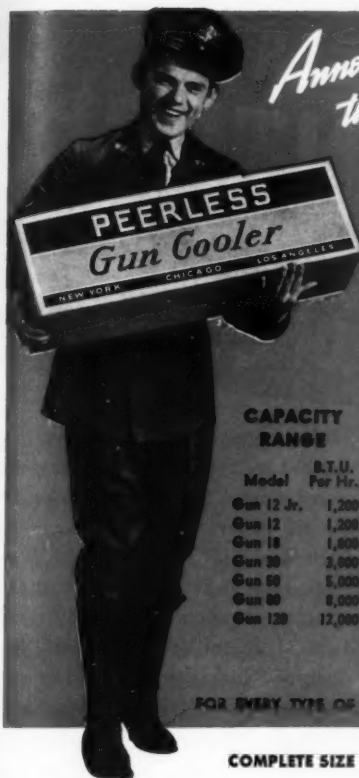
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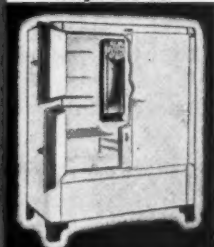
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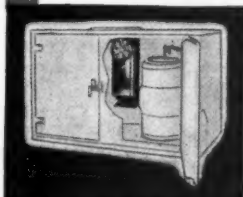
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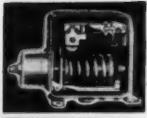
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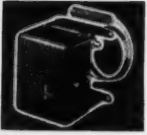
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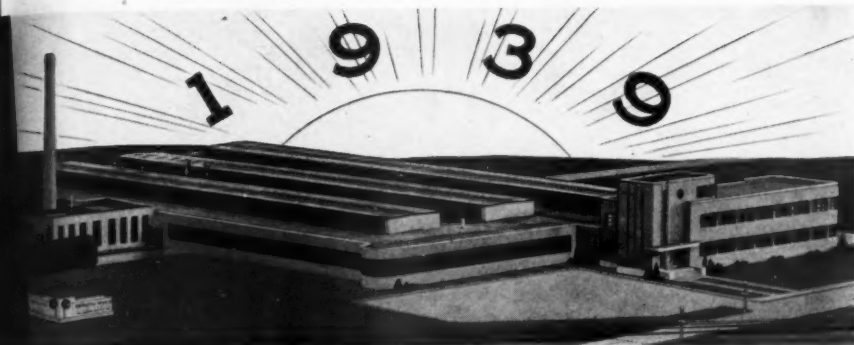
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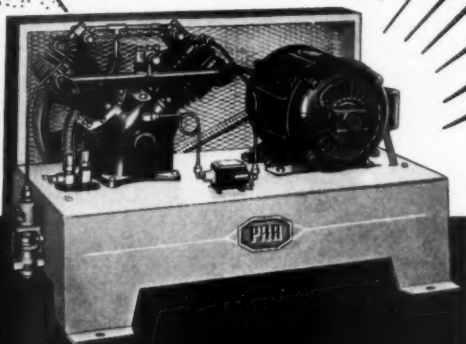
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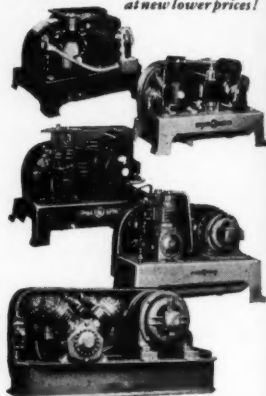
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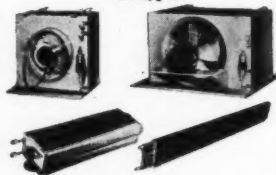


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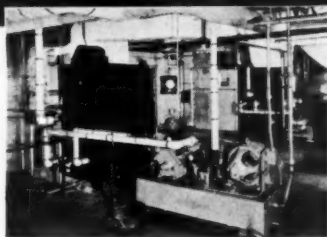
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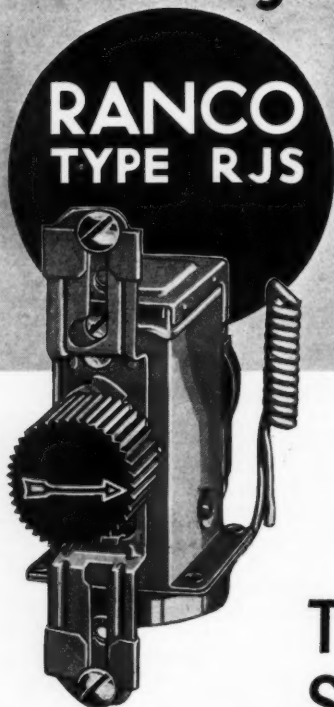


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The Refrigeration Service Engineer

Vol. 7

No. 2

February 1939

A Monthly Illustrated Journal De-
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frigeration Service Engineer in the
Servicing of Domestic and Small
Commercial Refrigeration Systems
and Oil Burners

Official Organ
REFRIGERATION SERVICE
ENGINEERS SOCIETY

Cover

Pictured on the front cover is a
Refrigeration Service Analyzer
built by Mr. E. N. Avery. The first
of a series of articles describing
its construction appears on page
11 of this issue.

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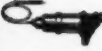


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SERVICE ENGINEER

TABLE OF CONTENTS

Building a Refrigeration Analyzer, by Edw. N. Avery	11
Accident Prevention and First Aid in Refrigeration (Second Article), by V. C. Kelsey.....	16
Field and Shop Data on General Electric Refrigerators (Second Article)	20
New Air Conditioned Buses Placed in Service.....	27
Question Box	28
Suggestions on Question 294.....	28
Miscellaneous Questions	29
First All-Industry Exhibition Introduces 1939 Lines	30
New Devices and Improvements Introduced at Exhibition	31
R.S.E.S. News	38
First Annual Winter Meeting of Illinois State Association	38
New Chapters Formed at Winnipeg, Canada and South Bend, Indiana.....	39
Newly-Elected Officers of Pittsburgh Chapter..	40
New Officers Elected for Des Moines Chapter..	42
Chapter Notes	44
Pittsburgh Ladies' Auxiliary.....	58
Tri-State Chapter and Ladies' Auxiliary Christmas Party	58
Tri-State Ladies' Auxiliary.....	58
Manufacturers' News	59

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The Refrigeration Service Engineer

Vol. 7, No. 2

CHICAGO, FEBRUARY, 1939

\$2.00 per Annum

Building A Refrigeration Analyzer

This is the first of a series of three articles on the construction and use of the most useful instrument (Pictured on the Front Cover) the Service Engineer can build.

By EDWARD N. AVERY



E. N. AVERY

DURING the past few years it has become evident that the well equipped shop gets both the bulk and the cream of the business. This applies especially to those shops that are equipped with instruments that enable the service man to diagnose the trouble accurately and quickly. Radio analyzers and tube testers have made their appearance in the radio service field, followed a short time later by motor analyzers in the automobile repair shops.

These instruments not only enable the service man to accomplish more in a given length of time but also eliminate a great deal of guesswork. They also create a definite and favorable impression on the customer.

While the better equipped refrigeration service shops are usually well supplied with testing instruments that are adequate, the refrigeration service engineer usually oper-

ates at a disadvantage, while in the field, due to the lack of a coordinated group of instruments meeting his requirements.

Since the customer's home, or place of business, is the refrigeration service engineer's shop to a large extent, it is apparent that a portable refrigeration service analyzer is necessary if one wishes to determine the nature of the trouble with accuracy and dispatch.

After giving the foregoing facts due consideration, the writer built a refrigeration service analyzer for his own use and it has proven itself so indispensable and created so much good will that full information is now being passed on to the writer's fellow refrigeration service engineers so that he who may wish to build one may have the benefit of the writer's experience and thus avoid the usual cut and try difficulties that always accompany the building of such an instrument.

After the analyzer is once connected to the unit under test practically any test may be applied without disturbing connections. Air or excess refrigerant may be purged out

of the system, refrigerant may be added, motors may be tested for faults or overload, motor starting capacitors and cold controls may be tested, the condensing unit may be started or stopped without opening the refrigerator door, the wiring may be tested for open circuits and for low voltage, the refrigerant and the oil may be tested for color, oil may be added and practically any test desired may be applied in a few minutes time and with little effort.

Advantages of Its Use

The analyzer gives the user a professional appearance which permits him to secure a greater return for his work and since it is no longer necessary to open or close the refrigerator door with oil stained hands every time it is necessary to start or stop the unit, customer good will is built up. The fact that the door remains closed and no warm air is admitted to the cabinet also permits the operator to complete his work in less time since there is no loss of refrigeration.

It is no longer necessary to make several trips out to the service car for each individual instrument as need for it arises since they are all contained in one easily portable case and a more businesslike appearance is maintained since a variety of boxes and cases have not been lugged in and distributed about the customer's premises.

As all the individual instruments are available at all times, many tests are run even when there is no indicated necessity for them, and many faults are therefore detected which would develop into trouble later on.

Since all tests may be run at the same time the work can be completed quicker and a better picture of what is going on inside the refrigerating unit is obtained by the operator. All tests are also run with greater precision since one thing depends on another to a large extent and all can be watched on the various instruments at the same time.

Both gauges being six-inch face, closer readings are possible, leaving no doubt in the operator's mind as to whether controls and expansion valves are adjusted to the proper point.

From the foregoing facts it may readily be seen that, while a great deal of time and some money must necessarily be spent in building one of these analyzers, the builder will be well repaid for his efforts in time saved and in customer good will.

Construction

In building this analyzer it was decided that all the necessary instruments must be contained in an easily portable case and must all be securely fastened to a panel, so arranged that the entire panel could be easily removed as a unit, in the event that any individual instrument required repairs.

Total weight being an important item, every care was taken to keep it to a minimum and how well this aim was attained can be judged from the fact that the finished analyzer and case weighs but 25 pounds.

Cost was also an important item to be considered, but the quality of the analyzer as a whole was never sacrificed in order to keep expenditures down.

MATERIAL LIST

Quantity	Description	Used for	G. E. No.
1	12"x21" 16 gauge blk. sheet iron	Panel	
1	3"x10" 16 gauge blk. sheet iron	Sub-panel	
3	1/4" 3-way packless valves	S-H & C	
2	Liquid indicators	No. 16 & No. 18	
1	Panel light	No. 17	
1	30" to 60 lb. compound gauge	No. 19	
1	0-250 lb. pressure gauge	No. 20	
1	Eight-day clock	No. 15	
1	0-10 ampere a.c. ammeter	No. 13	
1	0-150 volt a.c. voltmeter	No. 14	
1	Motor base	No. 1	GE 2711
2	Triple outlet receptacles	Nos. 2-3-4 & 10-11-12	GX 2A5
1	Pilot light and S.P. switch	Nos. 5-6	GX 3A1
1	2 S.P. & 1 3-way switch	Nos. 7-8-9	GX 1F1
1	D.P. switch	No. 7	GX 1B1
13	Rubber male caps	Extensions	M 210
7	Bakelite cord connector bodies	Extensions	GE 2718
80'	All rubber cord	Extensions	8 J Jr.
1	Keyless kitchen tap	Ass. No. 15	M 141
1	Service block	Extension No. 6	M 166
2	Rubber insulated test clips	Extension No. 9	
2	Insulated test prods.	Extension No. 10	
1	Keyless socket	Extension No. 11	
1	Old radio receiver	Acoustical tester	
1	Pencil extension light	Extension No. 12	
Miscellaneous nuts, bolts, screws, washers, paints, wood, hardware, wire, tubing, etc.			

A 16 gauge black sheet iron panel 12 inches wide and 21 inches long was secured and laid out and scribed to the dimensions given in Fig. 1. Black sheet iron was selected because it possessed the necessary strength to resist denting even though thin enough to permit mounting the various articles flush with the panel. Its use also permitted soldering fittings directly to the panel and provided a surface to which paint could be applied with no danger of peeling off later, which is a common occurrence where galvanized iron is used.

The eleven rectangular holes, numbers (2) to (12), were first drilled out as large as possible, and then, gripping the panel in a vise, the holes were filed out to the scribed outline with a three cornered file.

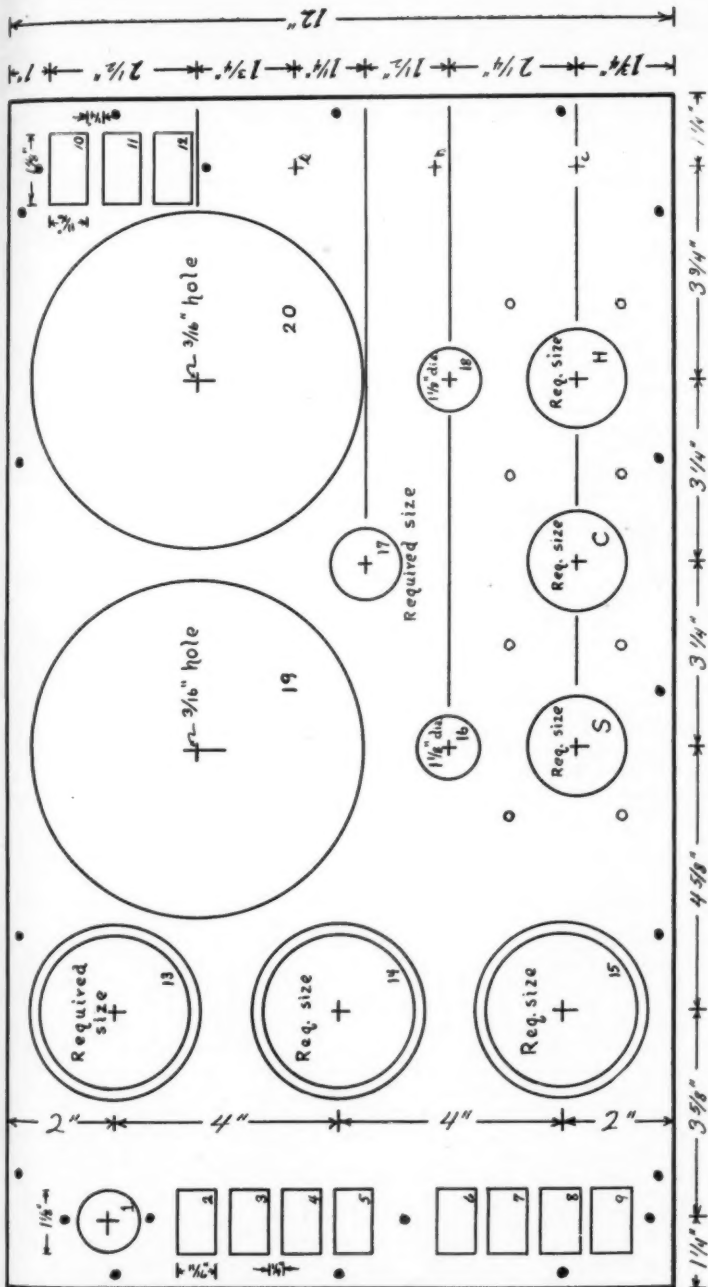


FIG. 1. PLAN OF PANEL FOR REFRIGERATION ANALYZER

The panel is made of 16-gauge black sheet iron, 12 inches wide by 21 inches long. Those items marked required size depend on the make and size of the material selected. Holes marked (a) should be drilled 3/16-inch diameter and are used as mounting holes. a, c and h are drilled 1/4-inch and then flared in to take 1/4-inch pipe tap. S, C and H will depend on the make valves selected. The holes marked (O) should be drilled large enough to pass an 8-32 brass machine screw.

Holes number (1)-(16)-(17) and (18) were first drilled out $\frac{5}{8}$ inch and then reamed out with a pipe reamer.

The large holes, number (13)-(14) and (15) and S-C-H were first drilled out just inside the scribed outline with a row of $\frac{1}{4}$ inch holes spaced as closely as possible and then, placing the panel on an anvil, the divisions between the holes were cut out with a sharp chisel. The holes were then finished to the scribed outline with a half-round file. If the builder has access to a circle cutter the job could be accomplished with less effort.

The three holes lettered S-C and H were first drilled out $\frac{1}{4}$ inch and then, supporting the panel from the rear, the holes were flared out slightly by driving a tapered punch in from the front. This provided more depth for the $\frac{3}{8}$ -inch pipe threads and allowed space for a fillet of solder.

Three $\frac{3}{8}$ -inch pipe thread x $\frac{1}{4}$ -inch flare half unions were then drilled out $\frac{3}{16}$ inch

The interior working parts of a 30-inch to 60-lb. compound gauge and a 0 to 250-lb. pressure gauge were removed from their cases and fastened directly to the rear of the panel by means of the brass machine screws that had originally held the face to the gauge. Since no two makes of gauges are alike no location for the mounting holes is given in Fig. 1, and only the shaft holes are shown. Flush mounting, back connecting gauges are available in six-inch face and should the builder care to go to the expense of buying a pair they would make a very fine job.

The two liquid indicators to be placed at (16) and (18) were taken apart and the sight glass and Duprene gaskets removed. A $\frac{3}{16}$ -inch hole $\frac{3}{4}$ inch deep was drilled in one $\frac{1}{4}$ -inch flare fitting end of each, and a $\frac{1}{4}$ -inch hole drilled to the same depth in the other end. A $\frac{1}{8}$ -inch hole was then drilled in the side of each liquid indicator, breaking into the original hole in the body.

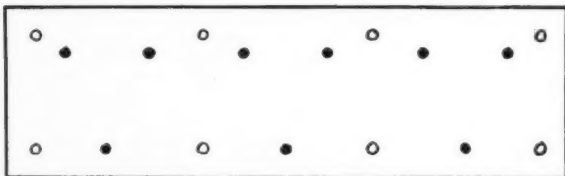


FIG. 2. THE SUB-PANEL
Size 3x10 inches. (O) Mounting
holes to pass 8-32 brass
screws. (●) Valve mounting
holes to pass 8-32 screws.

to a depth of $\frac{3}{4}$ inch on the pipe thread end. This was done so that $\frac{3}{16}$ -inch copper tubing could be soldered directly into the fitting when final assembly was begun. The half unions were then threaded into the holes S-C and H and soldered in place. By this construction all danger of their twisting loose, when a wrench was employed to tighten flare connections to them, was avoided.

All the necessary holes for mounting the panel and for mounting the instruments to the panel were next drilled and the panel was ready for finishing.

The panel was first given a coat of black Ironhide, which forms a very durable base for the following coats of lacquer. The Ironhide was allowed to dry for 72 hours and then sanded down with a fine grade of wet sandpaper.

After drying and dusting, three coats of black Dulux were sprayed on, allowing 24 hours for drying between coats and sanding with wet sandpaper between each coat. To insure a good hard surface before handling, the final coat was allowed an extra day for drying.

Suitable lengths of copper tubing of the proper size for each opening were then soldered in place and the liquid indicators were mounted on the panel.

This extra work of drilling and soldering was done so that the liquid indicators would mount tight against the rear of the panel. This would have been impossible if flare nuts had been used. It might be well to point out here that if thicker material is used for the panel it will be necessary to countersink either the body or the sight glass packing nut in order to secure a leak proof job at this point.

The free ends of the $\frac{1}{4}$ -inch copper tubing were then soldered into their respective gauge openings, care being taken to avoid overheating the body of the gauge and loosening the bourdon tube.

The free ends of the $\frac{3}{16}$ -inch tubing were then soldered into the holes previously drilled out in the half unions. Care was again exercised here in applying the heat and neither the paint on the panel nor the solder already holding the fitting to the panel was harmed in the least.

A Prest-O-Lite torch was used in making

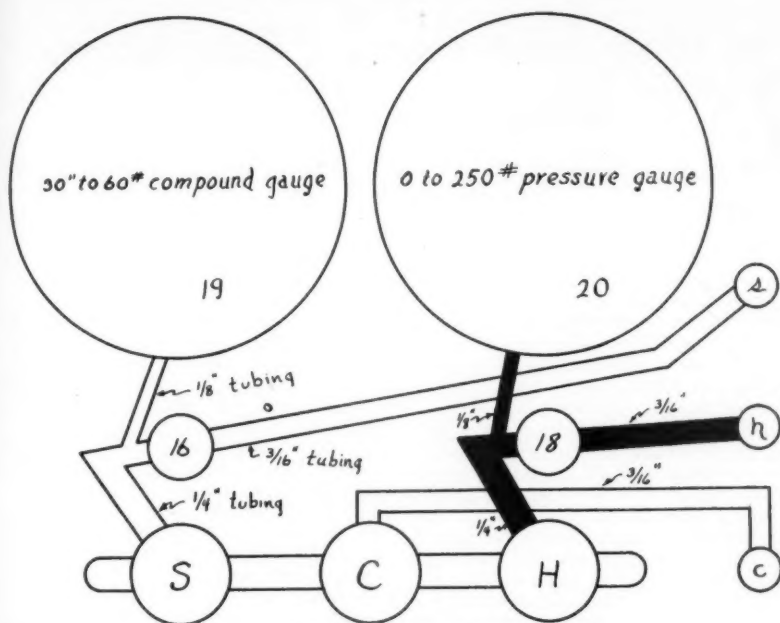


FIG. 3. REFRIGERANT CONNECTING LINES

S, C and H are packless hand valves connected through a manifold. 16 and 18 are liquid sight indicators.

all of these connections as it was found almost impossible to secure enough heat on the work to do a good job of sweating in the solder with a soldering iron. If the larger portion of the heat is applied to the tube being soldered in place, and not to the fitting, the builder should have no difficulty in securing a good solid job with no danger of loosening delicate parts or solder that has already been applied to some other part.

The three 3-way packless line valves were then mounted on the sub-panel (Fig. 2) and all straight through connections coupled together. Both end connections were then blanked off, while the branch connections were made up to their respective liquid indicators, except the branch on valve C which leads off to flare fitting marked C. Three way line valves were used because they took up less head room than angle valves and a manifold and were also easier to anchor firmly to the panel.

The sub-panel was then securely fastened to the panel by means of eight $\frac{1}{4}$ -inch brass rods $2\frac{1}{4}$ inches long which had been drilled and tapped out at each end to take 8-32 brass machine screws.

New six-inch gauge faces were then made

from a good quality of heavy cardboard and calibrated from the old gauge faces in inches vacuum, pounds pressure and the temperatures for the various refrigerants.

The original gauge hands were then clipped off near the hubs and new hands were made of steel wire. The new hands were then soldered to the hubs, care being taken to balance them so that in the event the analyzer is used in a vertical position the original accuracy will still be retained. A coat of black Dulux was then applied to the hands and they were placed in their proper positions on the gauges. Two six-inch wooden bezels which had been turned to match those on the electrical instruments were then obtained from the cabinetmaker and after applying two coats of Dulux and fitting them with heavy celluloid crystals they were fastened in place over the gauges by means of 6-32 brass machine screws which passed through holes in the bezels and were tightened in holes already tapped out in the panel. This construction makes it possible to remove them without disturbing the panel if it ever becomes necessary to reset the gauge hands.

To be continued in the March Issue

Accident Prevention and First Aid in Refrigeration Service

The first article of this series on safety appeared in the January issue and is concluded in this issue.

By V. C. KELSEY*

Cleaning Agents Are Both Acid and Alkaline

NITRIC ACID is a fuming and corrosive liquid. It corrodes nearly all metal except aluminum, gold and platinum. It eats through the clothing and causes painful burns. Its fumes are poisonous. A drop in the eye is likely to cause blindness. If it leaks on to wood or other organic materials, it is very likely to start a fire. To be safe when working around or with nitric acid, you should wear goggles, rubber gloves and a rubber apron. Rubber shoes are also a very good precaution and then with all of these precautions it should be handled with the greatest of care. Nitric acid also forms powerful explosives when mixed with carbolic acid, glycerine and numerous other substances. Therefore, do not mix it with anything unless you are absolutely sure that no harmful consequences will follow.

Sulphuric acid is peculiar in some respects. In a weak solution its corrosive action on metals, especially iron or steel, is greater than when it is pure or in strong solution. It has many of the same effects as nitric acid, but not so pronounced or effective. Use the same precautions with sulphuric acid as with nitric acid.

Mixed acid, which is nitric acid and sulphuric acid mixed, has the same characteristics as nitric acid.

Hydrochloric or muriatic acid gives off poisonous fumes and the fumes have a tendency to corrode the teeth. It is a good pickling agent but is capable of producing explosive mixtures. It is not, however, as hazardous as any of the previously mentioned acids.

In general, the action of acids on metal is likely to produce hydrogen in sufficient quantities to produce explosive mixtures. Therefore, if you have an acid stored in a

metal container, open flames and work that may produce sparks should be kept away.

Caustic soda, sodium hydrate, sodium hydroxide or lye is an alkali which is the most dangerous of all alkalis. It very quickly attacks the eyes, flesh, clothing and leather. It is poison if swallowed.

Caustic potash, potassium hydrate or potassium hydroxide is quite similar to caustic soda but not quite as dangerous.

In the handling of acids or alkalis, goggles should always be worn together with such protective clothing as rubber gloves, rubber shoes and long length rubber aprons.

First Aid:—for Chemical Burns

- (a) For acid burns—nitric, sulphuric, mixed, hydrochloric, acetic oxalic and picric (for oleum, first wipe off oleum with a clean cloth)—bathe freely with water and apply a saturated solution of bicarbonate of soda.
- (b) For alkali burns—caustic potash, caustic soda, ammonia, lime and soda ash—bathe freely with water and then apply a 2 percent solution of acetic acid.

First Aid:—for Fume Poisoning

- (a) For persons who have inhaled acid fumes or vapors—nitric, sulphuric, mixed, hydrofluoric, carbonic, hydrochloric—mix fifteen drops of chloroform in a glass of water with a tablespoon of aromatic spirits of ammonia. This mixture should be administered to the patient a little at a time so that he takes the whole glassful in thirty minutes to an hour.
- (b) For persons who have inhaled ammonia—frequently apply cold compresses and aqueous solutions of boric acid to the eyes.

First Aid:—for Internal Poisoning

- (a) For persons who have swallowed acids—sulphuric, nitric, hydrochloric, mixed,

* Accident Prevention Dept., Commercial Standard Insurance Co. Paper delivered before December 13 Meeting, Chicago Chapter R.S.E.S.

hydrofluoric, oxalic, picric and acetic—give powdered chalk or magnesia with a large quantity of water, or give baking soda, soap or wood ashes with milk. olive oil, or white of an egg in water.

- (b) For persons who have swallowed alkalis—caustic potash, soda ash, ammonia, caustic soda, and lime—give water freely, with vinegar, citric acid, cider, orange or lime juice; follow with milk. barley water or white of an egg in water.

Carbon tetrachloride is a good solvent. Its fumes are anesthetic in action and it produces a slight odor. A 2 percent concentration is dangerous to life for a period of one hour or less. In contact with hot surfaces it is likely to produce a deadly poison known as phosgene. It is a very commonly used fire extinguisher and is otherwise known as pyrene.

Automobile Accidents

In connection with your work, automobiles are used a great deal. We find that automobile accidents are caused by the following practices, which are altogether too common: Excessive speeds, or exceeding the speed limit; cutting in and out; drinking while driving; passing cars at intersections; double parking and other forms of improper parking; carrying of riders; failure to observe stop signs; starting off and running through the yellow light at stop and go signals; left turns in front of on-coming traffic; and improper method of braking, particularly on slippery streets. Aside from these, excessively bright lights, or lights left in the high beam cause accidents. Great care should be taken in all alleys as children have a way of getting under the cars, in front of the wheels and dashing out from unexpected places. Never start out when parked in an alley without making a thorough inspection all around and under your car.

The correction of these causes of accidents is so obvious that I will not go into detail other than this:—Observe the speed laws; drive in a straight line, and if you change your course give the proper signal; come to a full and complete stop at stop signs and do not start across the street on a yellow light, wait until the green light comes on before you start; with respect to braking, leave the car in gear and the clutch engaged until you have come almost to a stop. This will keep the rear wheels turning and greatly assist in avoiding skidding.

Dog Bites

You may at times come in contact with vicious dogs. Some protection from dogs can be obtained by wearing of puttees and high-top boots. However, the best method is to secure the cooperation of the customers and have them properly chain or confine the dog so that you will not be exposed.

In case you happen to be bitten by a dog, waste no time in getting medical attention as serious results can sometimes occur.

Contagious Diseases

With respect to contagious diseases, it is necessary to protect your own health as well as the health of others. I am not going into any detail as to the proper procedure in this case, but suggest that each of you consult your family physician for advice or get in touch with the Health Department.

You are frequently called upon to test refrigeration systems and in such cases great care should be exercised, especially on high pressure systems. If air is used, the system should be blown out under low pressure to remove all oil and foreign matter. Then, as the test is made the pressure should be very slowly increased to avoid heating. If this precaution is not observed, excessive heat may be generated in some part of the system and an explosion occur as the result of any oil that may be left in the system.

Under no circumstances should oxygen be used to test a refrigeration system. Oxygen readily mixes with oil and creates explosive mixtures and when testing a system heat is generated and an explosion is almost inevitable. Be doubly sure that the gas you use for testing purposes is not oxygen. Carbon dioxide gas is probably the safest test medium to use.

Most of the refrigeration units are driven by electricity. True, it usually is only 115 volts or so, but don't get the idea that it can't hurt or kill, because it can and it has. A few simple precautions will practically eliminate the danger of serious injury. First—do not work on live circuits unless it is absolutely necessary and then be sure that you are well insulated from any ground so that you will not form a circuit between a live wire and the ground. I know of a case of 24 volts giving a fatal shock and another case where a soda fountain worker was electrocuted by a faulty connection on a malted milk mixer—110 volts. Now, an easy way to get a very severe shock, perhaps a dangerous one, is to try connecting the motor

without shutting off the electricity. If you make and break a connection to the motor, the voltage may build up much higher than the line voltage. This is particularly true of direct current motors. That is why the larger direct current motors are provided with no voltage releases so that when the main switch is opened a circuit is provided to permit the current flowing through the coils to die down gradually. Modern wiring uses two colors of wire, usually black for the live wire and white for the ground wire. The ground wire should always be connected to the shell of sockets, fuse plug outlets and similar outlets. If you must work on live electrical parts, use insulated tools. Most of you use extension cords. These should always be kept in first class condition. Portable electric tools should also be maintained in good mechanical and electrical condition. Low voltages can cause serious burns and flashes, particularly if you cross live wires or contact a live wire with a ground.

Air compressors and receivers are used for blowing out and various other processes in connection with your work. No system should be set up without an adequate safety valve. There should be an effective means of draining the air receiver at regular intervals to remove the accumulations of water and oil. It is well to drain these at least once a week. If any of you have homemade outfits, I would suggest that you have the equipment tested and inspected by properly qualified engineers.

Spraying Lacquers

When spraying lacquers or any decorative or protective coating, the safe practice is to provide a spray booth having good ventilation. The operator should wear an approved respirator. Electric lighting fixtures should be vapor proof. The booth should be kept clean and a good fire extinguisher should be provided.

I have been asked, "What do you do if you are overcome with methyl chloride or sulphur dioxide?" Now I ask, "What does anyone do when he is unconscious?" The point is—do not permit yourself to be overcome by any refrigerant because it is not necessary. Gas masks are provided and you should always use them when performing any operation where gas is likely to escape. Never put a wrench or other tool on a line containing refrigerant under pressure. If it is absolutely necessary to run this risk then put on your gas mask and goggles

making sure that the cartridge in the mask is for the particular refrigerant being used. Also protect your hands from coming in contact with a liquid refrigerant to avoid serious chemical burn or freezing. However, if anyone is overcome by a refrigerant it is usually well to remove him from the contaminated atmosphere and keep him warm and quiet and render artificial respiration. Of course, a doctor should be called as soon as possible, but do not neglect artificial respiration for even so much as a few seconds.

Sulphur Dioxide

Sulphur dioxide rarely if ever causes any damage to the lungs. Its effect on breathing is so pronounced, that very low concentrations cause extreme discomfort and causes one to seek fresh air at once. Death is likely to result from asphyxia and respiratory spasms before the gas reaches the lungs. In fact, the authorities, Henderson and Haggard, state that the gas is so irritating to the nose and throat that lethal concentration is almost irresistible. It is almost impossible to breathe it because of this fact. The indications are, therefore, that sulphur dioxide does not hurt the lungs.

Milk is a good item in any diet. However, I know of no special benefits from drinking it after exposure to a refrigerant.

"Do you recommend iodine for open cuts?" "Is balsam peru better?" "What do you recommend for first aid for eye attack of refrigeration gas—or carbon tetrachloride?" It is best to use iodine on fresh open cuts as it is a strong antiseptic. It is not recommended for old cuts. However, merthiolate is preferred by some doctors as it is considered a good antiseptic and does not destroy the healthy tissue as does iodine. Balsam peru is a good healing agent and is recommended for an old cut that is slow to heal. I believe we have already covered first aid in case refrigerant or any gas, acid or alkali is splashed into the eye.

Sulphur dioxide is not usually mixed with the chlorides as a detector. Acrolein or tear gas is usually recommended.

Nothing need be mixed with Freon as a detector.

"When Freon is mixed with chloride why doesn't it work?" Frankly, I am not an authority on the subject but find a difference in molecular weight, and wide differences between the gases as to the volume at given temperatures. Chances are the gases do not mix chemically and therefore one of the

gases will have the same effect as air in the system. May I add that I would not advise mixing refrigerants at all unless you know definitely what the chemical reaction will be. Risk your own life if you must, but conduct your experiments where you will not endanger the lives of others.

Gas masks should be either the cartridge type or the cannister type. Probably the cannister mask is best for high concentrations for extended periods of time. Either one must always have a new cartridge or a new load for the cannister after each use for the greatest safety.

Care with Soldering

Ordinarily the fumes from soldering are not harmful, but if you solder containers that have held the various chlorides or "F-12" or "F-114," phosgene may be generated. I would suggest no soldering be done in such cases until after complete purging and cleaning. No attempt should be made to solder any container that has held a flammable material either with an iron or flame soldering until the container has been most thoroughly and completely cleaned. The following is my suggested method for cleaning as found in the Industrial Data Sheet D-Chem. 10, issued by the National Safety Council:—

First: See that all sources of ignition, such as open flames and unguarded electric lights, have been eliminated from the vicinity of the container.

Second: Remove the bung with a suitable wrench and allow any liquid or free sediment to drain out. Long-handled or special wrenches are recommended. Steel chisels and hammers should not be used as they may create sparks which may ignite the vapor. The residue should be disposed of in a safe manner so it will not increase the hazard of the job.

Third: Fill the container with hot soda or soda ash solution and rotate it mechanically for five minutes or longer; then drain the container. Short pieces of BRASS chain inserted with the caustic wash will act as scrubbers and aid in loosening any caked accumulations in the drum or cylinder. Hammering with a WOODEN mallet will also help to loosen scale.

Fourth: Spray live steam into the container through the bung; then drain.

Fifth: Flush the inside of the container for a full five minutes with boiling water.

Sixth: Thoroughly drain and dry the container. This is usually done by turning it so that the moisture will drain out the bung

and by circulating warm air through the inside.

Seventh: Inspect the inside of the container to determine that it is clean. This may be done by using a mirror to reflect light into the container. If, upon examination, it is found that the container is not clean, repeat the third, fourth and fifth steps.

Eighth: Inspect to determine if the container is gas free. This test preferably should be made by means of a suitable gas detector. It is the practice in some companies, however, to flash test for gases prior to any welding operations. Under no circumstances should anyone make such flash tests until the container has been cleaned as outlined in steps 2 to 7, inclusive. To flash test, first up-end the drum or cylinder. Then stand well back and place at arm's length the tip of the lighted welding torch into the bung of the container. Should the drum or cylinder not be gas free, a flash will follow. It, therefore, is of vital importance that during such tests, the operator stand as far away as possible.

In handling the cleaning materials, of course, the safety measures previously discussed should be observed.

In conclusion, we may summarize as follows:—

1. Safety demands eternal precaution.
2. Anticipate the results of your actions; if safe, go ahead; if not find a safe method.
3. Know your business thoroughly.
4. Plan your work and work your plan.
5. Be systematic.
6. Watch your health so that you may have a clear head.
7. Make safety a habit.

Concluded

§ § §

George S. Fox
Wisconsin

Enclosed is check for \$2.00 to pay for the renewal of my subscription to the R.S.F.

In my opinion, this is one of the best investments I have ever made.

L. P. Edwards
Wisconsin

I have been a subscriber to your little magazine about a year, and hope to continue. Keeping one informed of new improvements and reviewing the old at times, I think it should be in the hands of all servicemen.

Field and Shop Data on General Electric Refrigerators

THE ELECTRICAL SYSTEM

This is the second of a series of articles designed to familiarize the reader with the construction and operation of G. E. units. The first article appeared in the January issue.

INCLUDED in the electrical system of the General Electric refrigerator is a motor and a control panel. This control panel is contained in a suitable box, mounted on the cabinet top at the left of the compressor, and consists of: a thermostatic switch, which controls the on and off periods of the motor in response to the temperature changes of the cabinet; a manual switch, which is marked for its on and off positions; an over-load protective device; and a starting relay.

Temperature control is accomplished in the conventional manner through a metallic bellows, to which is attached a copper tube, leading to and fastened on the evaporator. These bellows are charged with sulphur dioxide—the same refrigerant as used in the machine proper. Increase or decrease of temperature in the chilling unit reacts on the automatic switch, stopping or starting the machine as required. Adjustment of this temperature is provided through a tension spring and adjusting nut. Also provided is a temperature adjusting dial for the use of the customer.

The purpose of the starting relay is to close the starting contacts and thereby energize the starting winding, supplying the additional torque necessary to bring this motor up to speed. For the smaller units, a resistance, contained in the control box, is placed in the circuit with the starting winding. Larger units employ a capacitor in this circuit, which limits the amount of current going to the starting winding. When the motor reaches its rate of speed, the starting winding is automatically connected to another point on the capacitor unit, and the motor runs as a polyphase motor.

The capacitor on the larger units increases the power factor, and decreases the starting and running current.

Adjusting the Temperature

CR1050-A Control—Fig. 7. Turning the main temperature adjustment screw (11) in a clockwise direction decreases the tension on the main temperature adjustment spring (22) and decreases the temperature. Turning the screw counter-clockwise increases the temperature.

When adjustment becomes necessary, it may be due to other causes in the control and the following should be checked:

If the metallic bellows is weak, replace it. The main temperature adjustment spring may be weak and should be replaced. Check the door seal and the seal between the unit and cabinet. Leakage at these points will cause an increase in cabinet temperature.

Adjustment of the main temperature adjustment screw (11) changes both the cut-in and cut-out temperature without a change in range. In nearly all cases, no change in range is necessary. In some cases, however, it may be desirable to secure a wider or shorter range. This may be done through the adjusting screw (14) which regulates the cut-in temperature only. Turning it clockwise will raise the cut-in temperature; counter-clockwise will lower the cut-in temperature. Adjustment of this screw changes the tension on spring (16).

CR1050-C Control—Fig. 8. By manipulation of the temperature adjusting drum (11) the customer may secure a temperature variation of approximately $2\frac{1}{2}$ degrees plus or minus from the normal point. Turning the drum upward will lower the temperature, while turning it downward will raise the temperature.

If further adjustment is necessary, it may be made by loosening the lock nut and turn-

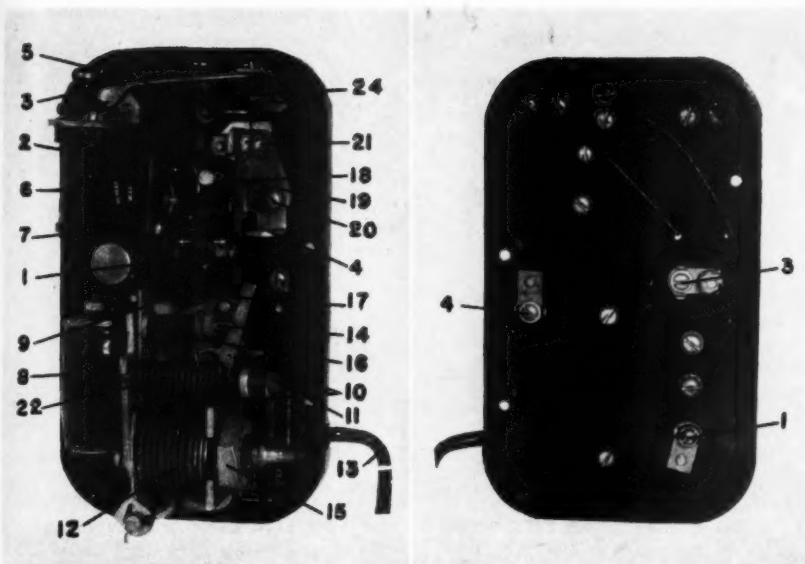


FIG. 7—FRONT AND BACK VIEWS OF 1050-A CONTROL USED ON DR-2 UNITS

- | | | |
|-------------------------|----------------------------|-----------------------------------|
| 1. Manual switch | 9. Spring | 16. Range adjusting spring |
| 2. Main switch contacts | 10. Trip mechanism | 17. Inner trip arm |
| 3. Starting contacts | 11. Temperature adjustment | 18. Thermal cut-out heater |
| 4. Thermal cut-out | 12. Thermostat bellows | 19. Overload adjusting plate |
| 5. Relay contact arm | 13. Thermostat feeler bulb | 20, 21. Overload adjusting screws |
| 6. Relay coil | 14. Range adjustment | 22. Temperature adjusting spring |
| 7. Relay armature | 15. Bellows clamp nut | 24. Starting arm spring |
| 8. Starting resistance | | |

BACK VIEW

- | | | |
|--|---------------------------------------|-------------------------|
| 1. Connect white lead — starting winding | 3. Connect red lead — running winding | 4. Main line connection |
|--|---------------------------------------|-------------------------|

ing the knurled screw (23) which regulates the tension on spring (22).

To raise the temperature, increase the spring tension. To lower the temperature, decrease the spring tension.

If it becomes necessary to change the range between cut-in and cut-out temperature, adjust the screw (14) after loosening the lock nut. Turning the screw in will decrease the range; turning it out will increase the range. Under no circumstances must this adjustment be made so that the gap between the contacts is more than $5/32$ -inch or less than $1/16$ -inch when the contacts are in the off position.

CR1050-D Control—Fig. 9. This control is used on the DR-1-A unit only. Through the adjusting knob (11) the customer may secure approximately 10 degrees variation in evaporator temperature either way from the zero or midway position. Further adjustment can be made by removing the screw

which holds the knob, and then removing the knob itself. Turn the knob back a few degrees and replace.

The temperature difference between cut-in and cut-out temperatures should be about 13 to 15 degrees. Any change in this will have a corresponding change in operating periods of the unit. If a change is necessary, however, it may be made by adjusting screw (14) which will increase or decrease the gap in the main contacts (2). Increasing the gap will increase the range, etc. This gap must not be less than $1/16$ -inch nor more than $5/32$ -inch with contacts in the off position.

CR1050-E Control—Fig. 10. Temperature adjustments of this control are made in the same manner as those in the CR1050-D control, which has been described in the previous paragraph.

Replacing the Control Bellows

To test the bellows and determine whether or not it has lost its charge, remove the end

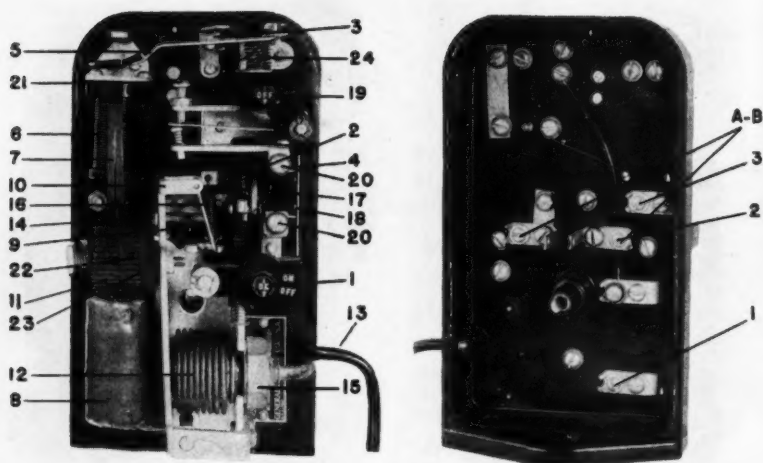


FIG. 8—FRONT AND BACK VIEWS OF 1050-C CONTROL USED ON DR-2 UNIT

- | | | |
|------------------------|----------------------------|----------------------------------|
| 1. Manual switch | 9. Bridle | 17. Flexible lead |
| 2. Main contacts | 10. Control lever | 18. Overload cut-out heater |
| 3. Starting contacts | 11. Temperature adjustment | 19. Manual main switch |
| 4. Overload cut-out | 12. Thermostat bellows | 20. Terminals |
| 5. Relay contact arm | 13. Thermostat feeler tube | 21. Adjusting screw—overload |
| 6. Relay coil | 14. Range adjusting screw | 22. Temperature adjusting spring |
| 7. Relay armature | 15. Bellow clamp nut | 23. Knurled adjusting nut |
| 8. Starting resistance | 16. Bridle spring | 24. Relay arm spring |

BACK VIEW

- | | |
|------------------------|----------------------------|
| 1. White lead—starting | 3. Red lead—running |
| 2. Black lead—common | A-B. Oil conditioner leads |

of the tube that is fastened to the evaporator, and warm with the hand. If the bellows is okay, it should show a noticeable expansion and start the unit. If it does not expand, it has lost its gas and will have to be replaced.

On the 1050-A and 1050-C controls, it will probably be necessary to remove the entire control so that the bellows may be changed. On others, it is possible to make the change with the control in place.

Loosen the clamp nut on the bellows and remove the clamp from the evaporator. Straighten the tube leading from the bellows and pull the tube through the top of the box.

With the new bellows still in its clamp, push the new tube through the cabinet top and, before transferring the bellows from its clamp to the control, chill the tube by holding it against the evaporator, or submerging in ice and salt mixture. This will contract the bellows sufficiently so that the transfer from clamp to control may be made.

Tighten the bellows clamp nut on the con-

trol and replace the control on the box if it has been removed. Also, check the temperature adjustments.

Field Service Adjustments

The analysis of troubles on hermetically-sealed machines is essentially the same as that on open-type machines. The difference lies in the fact that because the hermetic machine permits the reading of the high side pressure only through the charging and purging valve, the service engineer is forced to resort to the use of a thermometer to observe the symptoms of trouble. It will be found, however, after a little practice, that the trouble may be as readily isolated with the use of a good thermometer as with a compound gauge. Be certain that your thermometer is accurate and of a good grade. A regular pocket service thermometer with graduations on the glass tube is recommended. Never accept the customer's thermometer as correct.

The cabinet temperatures should be taken in the center of the middle shelf, or, in other words, as near as possible to the center of

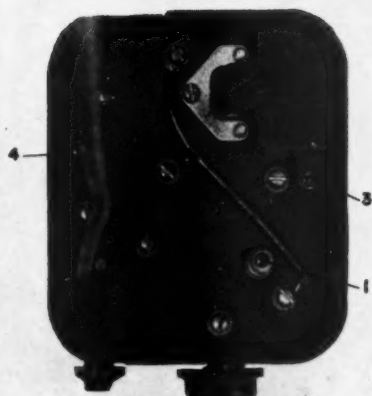
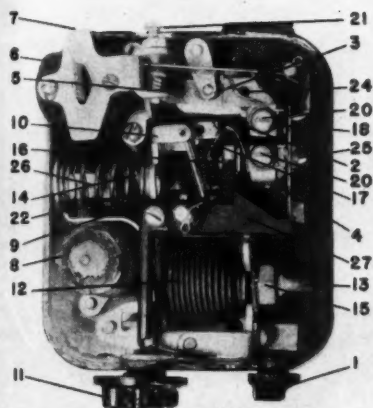
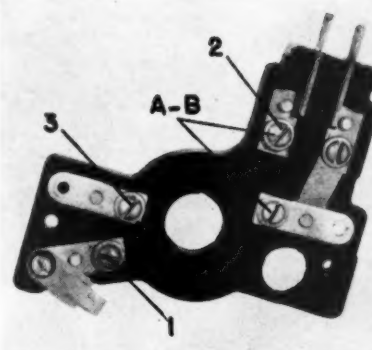


FIG. 9—VIEWS OF FRONT, BACK AND BASE OF 1050-D CONTROL USED ON DR-1 UNITS

1. Manual switch
2. Main switch contacts
3. Starting contacts
4. Overload cut-out
5. Relay contact arm
6. Relay coil
7. Relay armature
8. Starting resistance
9. Bridle
10. Automatic control arm
11. Temperature adjustment
12. Thermostat bellows
13. Thermostat feeler tribe
14. Range adjusting screw
15. Bellows clamp nut
16. Contact arm bridle spring
17. Flexible lead
18. Overload heater
19. Base
20. Heater terminals
21. Overload adjustment
22. Temperature adjusting spring
24. Starting contact arm spring
25. Common lead connection
26. Motor running lead connection
27. Trip mechanism and indicating arm

BACK VIEW

1. Connect starting winding
3. Connect running winding
4. Connect line



BASE

1. White lead—starting
2. Black lead—common
3. Red lead—running
- A-B. Green leads—oil conditioner

the cabinet storage space. Evaporator temperatures can be taken by inserting the thermometer under the thermostat bulb clamp at the back of the evaporator. Cabinet doors should be kept closed, and the thermometer in place at least ten minutes before a reading is taken. In taking these readings, it must be remembered that a thermometer will begin to rise the moment the door is opened, and every effort should be made, therefore, to make this reading as quickly as possible. Where sufficient time permits, an accurate reading may be obtained by inserting the thermometer in a glass of

water, and the tube placed in the refrigerator for several hours. This will eliminate the trouble of sudden changes when the door is opened, and will give a convincing proof to the customer as to the actual food temperature in the cabinet. This method, of course, can be used in conjunction with any liquids that may be in the cabinet for measuring actual cabinet temperatures. Be sure, however, that they have been in long enough to register the true temperature.

In the following are outlined most of the causes for calls that may be received on the General Electric refrigerator. It should be

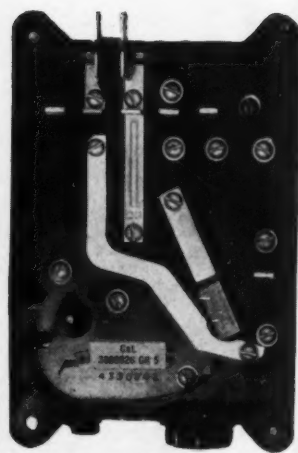
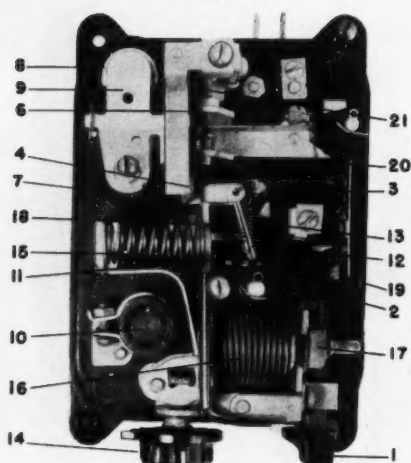
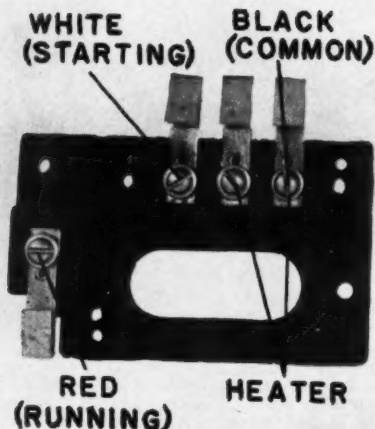


FIG. 10—VIEWS OF THE FRONT, BACK AND BASE OF THE 1050-E CONTROL USED ON DR-1 AND DR-2 UNITS.



- 1—Manual switch
- 2—Trip and indicating arm
- 3—Main contacts
- 4—Starting contacts
- 6—Starting contact spring
- 7—Relay series coil
- 8—Relay shunt coil
- 9—Relay armature
- 10—Starting resistance
- 11—Automatic control lever
- 12—Bridle
- 13—Contact arm bridle spring
- 14—Temperature adjustment
- 15—Temperature adj. spring
- 16—Thermostat bellows
- 17—Bellows clamp nut
- 18—Range adjusting spring
- 19—Overload cut-out
- 20—Overload heater
- 21—Overload adjustment

Prongs of base fit into slots in back of control making electrical connections.

Unit Will Not Start

No Voltage at the Motor, Low Line Voltage, Line Overloaded. Check fuses to see that they are not blown. If the voltage drops below 90 volts, the unit will not start. Check the voltage. This will be indicated by dim lights. Check the line for overload. If too many appliances or lights are placed on the same circuit as the refrigerator, a sharp drop in voltage will occur as the refrigerator switch is closed. Lights on the same circuit

remembered, however, that the customer will not always be accurate in describing the failure of his equipment. At times, it may even be found that the equipment is working satisfactorily, but the customer, due to his unfamiliarity with it, thinks there is something wrong. It is important, therefore, to verify the complaint by our own observations of symptoms and characteristics of operation. In our following analysis we will assume, however, that the customer is correct in reporting the trouble.

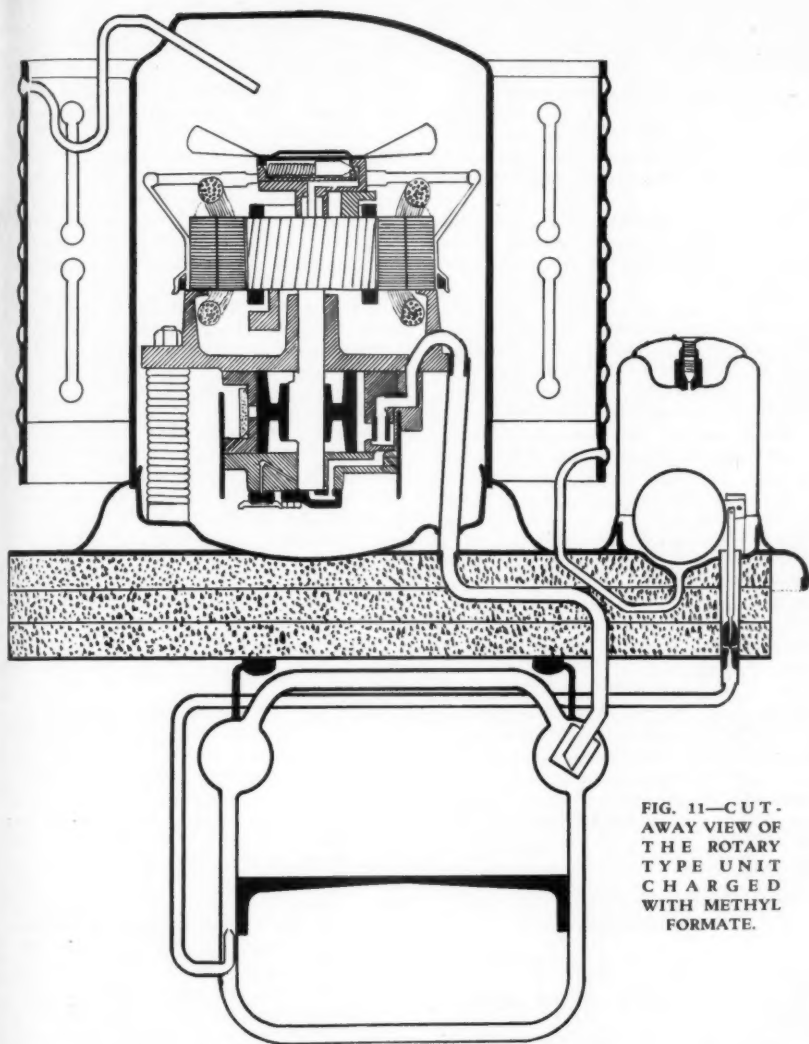


FIG. 11—CUT-
AWAY VIEW OF
THE ROTARY
TYPE UNIT
CHARGED
WITH METHYL
FORMATE.

will dim, and if the voltage drops below 90 volts, the refrigerator will not start. This, however, should not be confused with the flicker in lights when any refrigerator starts.

Open Running Winding. This condition will be indicated by the lack of any spark when the main contacts are opened and closed. Wiring on the back and front of the control should be checked for loose or open connections, and if no trouble is located at

these points, it must be in the compressor dome, and the unit will have to be replaced.

Starting Contacts Do Not Close. The 1050-E control is not subject to this trouble; therefore, the following information refers to other controls only. The upper half of the starting contact may be bent up too far, in which case the contact may be bent down until a firm contact is made. The spring under the starting arm may be too weak,

and should be stretched or replaced. If the running winding is open, the starting relay will not pick up. Starting contacts may be pitted, or dirty, causing poor contact.

Starting Contacts Close, But Unit Does Not Start. (1) Try replacing the resistor. In the DR-1 and DR-2 units, an open circuit in the starting resistor will cause this condition.

(2) Check the capacitor on capacitor-type units. This may be done by placing a heavy piece of paper between the starting contacts and then attaching a jumper between the starting contact arm and the connection to which the overload heater wire is attached. Try starting the motor and, if it starts, the capacitor is defective and will have to be replaced. If the wires on the new capacitor are too short to reach the control panel, cut the wires near the old capacitor, and splice the new ones to them, being sure to connect like colors and soldering all splices. If the wires on the new capacitor are long enough, the old wires may be disconnected at the control panel, and a heavy cord attached to them before the wires are pulled through the cabinet top. The wires on the new capacitor can then be attached to the cord, which will serve as a means of pulling them back into place. Be sure that your connections at the panel are tight.

(3) Open circuit in the control panel or in the motor. If, after checking all connections, no opening is found in the circuit, the trouble will probably be in the motor, and the unit will have to be replaced.

(4) If the compressor is stuck, the overload will trip when the starting arm picks up. In this case, the unit will have to be replaced.

Unit Shuts Off and Will Not Start Automatically

Starting Contacts Do Not Open. This may be due to the starting armature or arm binding. Clean the contacts and free the binding point.

High Voltage. Except on the 1050-E control, high voltage may cause the starting arm to remain closed after the motor has started. This causes high current consumption and the consequent tripping of the overload. Pull the arm down by hand, and if the unit runs satisfactorily, the voltage is too high.

In the 1050-A or 1050-C control, a 10-30 screw from $\frac{1}{4}$ -inch to $\frac{1}{2}$ -inch long can be inserted in the hole provided for adding additional weight to the armature. In the

1050-D control, used on DR-1-A machines, the weight can be made of lead in the form of slugs and be added to the top of the relay armature in the hole provided instead of in the bottom. Care should be taken to avoid getting so much height in these weights that they strike the top of the control box.

Excessive current being drawn by the motor will cause the overload to trip out. When the unit is first started after a long idle period, this will often happen. The trouble can be remedied by adjusting the overload cut-out.

Overload Too Sensitive. This device should never be adjusted except where absolutely necessary, and it must be remembered that if adjustment is made so that the time required to trip it is too great, damage may occur to other parts. Before making any adjustment, or checking the tripping time, make sure that the motor is under normal load and that the evaporator is down to temperature. While holding the starting contacts closed, note the time required to trip the overload. On the 1050-A and 1050-C controls, the time required is 15 to 25 seconds. The 1050-D control will require 12 to 18 seconds. The setting on the 1050-C control is approximately 18 seconds.

If the time does not correspond with that given above, adjustments may be made as follows:

On the 1050-A control, Fig. 7, the adjusting screw (20) is loosened and the adjusting plate moved to the left to increase the time element, or to the right to decrease the time.

On the 1050-C and 1050-D controls, Figs. 8 and 9, adjustment may be made by the adjusting screw (21). Screwing down decreases the time; screwing up increases the time. The space between the heater wire (18) and the bimetallic strip (4) should be about $1/32$ -inch. Space between the bimetallic strip (4) and the starting button arm should be $1/32$ -inch on the 1050-C control, and $1/64$ -inch on the 1050-D control.

After adjustment, tighten the adjusting screw and allow several minutes for the bimetallic strip to get back to normal; then check again.

Short-Cycling (1050-A Control Only)

Failure of the latch mechanism (10) in Fig. 7 will cause short-cycling of the machine.

As the bellows (12) expands and contracts, the main contacts (2) should open or close with a snap-action provided through the latch mechanism (10). If the contacts

should open without the latch operating, they will separate barely enough to break the circuit, and will soon close again, starting the machine. The contacts will burn badly, due to the slow breaking action. Causes of this trouble may be due to one of the following:

The horizontal spring (16) on the temperature range adjustment may not be under any compression, and the contact arm will, therefore, not be held snugly. This is the smaller of the two adjusting springs, and the knurled nut (14) is used to adjust it. If this nut is out too far, the contact arm will not be firmly held, and the latch mechanism will not operate. The knurled nut should not be set less than $\frac{1}{4}$ -inch from the end of the screw.

Using a long-nosed pair of pliers, and exerting just enough pressure to bend the strip, the thin latch (17) which is attached to the contact arm may be bent with a slight turn to remedy the trouble.

The leaf spring (9) on the lever, operated by the bellows, may be loose or out of shape. This is a remote possibility, but may give trouble.

The most probable source of this trouble is in the spring (16), which was mentioned in the foregoing. Before making any other adjustments, be sure that this spring is under tension.

Erratic Refrigeration

Under further questioning, the customer will probably inform you that the refrigerator occasionally either defrosts or freezes everything in it without any change in the control setting. The trouble is nearly always in the control.

The control parts may be binding and move very stiffly, due to considerable friction at some point, or to the accumulation of foreign substances. Clean all parts, and see that a free action is obtained.

The bellows may be losing its charge. If it feels weak when compressed by hand, it should be replaced.

The bellows tube may not be firmly clamped to the evaporator. Be sure that a good contact is made.

On 1050-A control only—check the latch action, as described under short-cycling.

On 1050-C, D and E controls—the bridle

spring or main temperature adjusting spring may have become weak and require replacing.

Where occasional freezing of foods takes place, the cause may be due to the failure of the movable arm on the control to move far enough to the right to bring the bridle far enough off center to trip open the main contacts. This may be remedied by bending the fixed main contact arm to the left.

A shallow control cover, which binds the movement of the "on" and "off" indicating arm, may cause the trouble.

Erratic refrigeration may be due to the changing ambient temperatures. For instance, if the refrigerator is located in a place where the surrounding temperatures during the day are from 70 to 85 degrees, but at night are reduced to 40 or 50 degrees, it is natural to expect a wide variation in inside cabinet temperatures.

In next month's issue will appear further information on G. E. units including shop repairs and shop routine.

\$\$\$

NEW AIR CONDITIONED BUSES PLACED IN SERVICE

FOUR giant steel and aluminum air conditioned buses with complete toilet facilities, a "snack" bar and de luxe accommodations for 28 passengers were "launched" recently to open a new era of transportation between Cincinnati, Chattanooga and Jacksonville.

The new fleet left from the headquarters of the Greyhound Southeastern Lines to inaugurate the service, but after the first trip, Cincinnati will be the northern terminal. Only stops on the fast express route will be Cincinnati, Chattanooga, and Jacksonville.

This "launching" marked the first use of "built-in" air conditioning in buses on the Southeastern Route. The coaches were built by the A.C.F. Motors Co. with provision for complete air conditioning. The Carrier air conditioning system installed is the same as that used on the Santa Fe lines in the southwest desert and the Nairn lines in the Arabian desert.

Built primarily for de luxe, long distance service, these four coaches will carry a steward to serve passengers from a "snack" bar. Toilet facilities are in the coach rear.

The Question Box

Readers are invited to send their problems pertaining to the servicing of household refrigerators and small commercial refrigerating equipment as well as oil burners to "The Question Box."

SUGGESTION ON QUESTION 294

QUESTION 294 referring back to Question 235 has interested me considerably and seeing that the condition of the case is no better than it was before Question 235 I would like to offer a few suggestions through which I hope the reader may obtain the desired results.

The question is to obtain temperatures of 42 degrees in the top section and 32 degrees in the storage section of the case and still have normal defrosting of the coils, during the off cycle.

Inasmuch as there are two thermostatic expansion valves on the coils I assume that the top and storage sections are separated by a partition formed by the bottom of the display section. If there are openings for the air from the top to enter the bottom part of the case I suggest closing such openings so that you have two separate compartments to cool.

The storage compartment doors are opened less than the display compartment doors, judging by the lower temperature obtained in the storage compartment, and inasmuch as this coil frosts heavily and does not defrost during the off cycle, I would suggest the installation of a constant pressure valve on the suction line of this coil. This valve might be adjusted for a pressure of about 18 lbs. giving a refrigerant temperature of 26 degrees F. and would maintain a cabinet temperature of 32 to 35 degrees depending on the type of products stored and how often the door is opened. Some adjustment might have to be made depending on the load.

Do not try to obtain temperatures lower than 32 to 33 degrees as the coil becomes inefficient as soon as frost accumulates.

Judging from your description of the case it has an icer extension along the back and fin coils are installed here together with a plain tube coil along the bottom of the display section. The warm air circulates

over the fin coil first and then over the plain coil before it is forced up in the front part of the case. Now if part of a continuous tube coil frosts up and the other part does not show any sign of frost you will most often find two things wrong. One is that warm outside air enters the case directly above the frosted part of the coil—through a badly fitting icer door—poor gaskets, meat scraps and dirt preventing the door from closing properly, etc. This warm and moisture laden air deposits frost in a very short time. Check for any air leaks—even small ones will cause trouble.

Second, vegetables or sea food may be stored directly opposite the frosted part of the coil—these foods giving off considerably more moisture than meats. This naturally throws an uneven moisture load on the coil.

It also appears from your sketch that the expansion valve bulb is fastened immediately after the plain tube coil in the coldest part of the compartment. I would suggest installation of a piece of tubing connected to the outlet of the plain tube coil extending up above the fin coil. Then run the whole length of the case and back again before connecting to the suction line leading to the machine. Fasten the expansion valve bulb where the tubing enters the fin coil compartment and let the rest of the tubing act as a dryer coil. In this way the expansion valve will not be held closed by the action of very cold air or slow moving slugs of liquid refrigerant which may accumulate in the plain tube coil, but will always be affected by the varying loads on the case. As it is now the fin coil is probably starved for liquid refrigerant part of the time. The expansion valve should be connected so that the gas enters the fin coil first. Valve bulb should be fastened in a horizontal position.

A control setting of 25 lbs. cut-in and 8 lbs. cut-out should be satisfactory for normal load and a machine heavy enough to take care of the gases evaporated.

This brings us to another point worth

mentioning now. Any 12 ft. case should have a $\frac{1}{2}$ hp. machine connected to it in order to obtain proper results, but we have often seen a $\frac{1}{3}$ hp. machine with a $\frac{1}{2}$ hp. motor on it pose as a $\frac{1}{2}$ hp. machine whereas in reality it will never be more than a light $\frac{1}{2}$ hp. machine and cannot produce the required amount of refrigeration. Any attempt to make a machine do more work than it is designed for will make the machine run excessively long times and no rules can be given for adjusting the controls; also heavy frosting of the coils will occur under such conditions. Would suggest that you find out whether your machine will measure up to a capacity of at least 3,000 B.t.u. per hour with a back pressure of 12 lbs. average and an average refrigerant temperature of 18 degrees F.

Thermostatic expansion valves should not be adjusted to any certain pressure. They serve the purpose of keeping a coil fully refrigerated at all times. See that they are adjusted so that the frost line reaches the feeler bulb.

It is also important to see that there is proper air circulation in the case at all times—no paper on the shelves, etc.—and that the case is not loaded to the point where air circulation becomes impossible.

I would appreciate knowing what results are obtained with the suggestions made here when the job is straightened out so we may all benefit by your experience.

Paul Jacobsen, Marion, Ind.

MISCELLANEOUS QUESTIONS

QUESTION 296. (1) Working with F-12 as a refrigerant, what is its boiling point?

(2) Does F-12 on the low side work on back pressure or vacuum, and if so, could you specify number of pounds in back pressure, or if it is in vacuum in inches, its temperature for different settings or temperatures?

(3) Is it true that for F-12, the motor driving the unit must be of larger size than for SO₂, and so its speed must be greater, and if so, by how much?

(4) Using F-12 as a refrigerant for an ice cream cabinet using brine, what is the best brine for same, and what percentage in its mixture? On the last question, I mean if the brine consisted of a solution of alcohol and water (60-40) would you advise changing same to calcium chloride, and if so, how and how much?

(5) I want to make a homemade dehydrator. Would you please advise me how to construct same?

(6) Recently, I had a call on an ice cream unit where the motor burned out. After I replaced the motor, I noticed there was a leak in the brine, but after the brine was cooled down, the leak stopped. Could you explain same?

(7) What is the best thing to stop a leak in the brine temporarily?

ANSWER: The boiling point of Freon, or F-12, is -22° F. at atmospheric pressure.

F-12 will, in most applications of refrigeration, work on a back pressure of something above 10 lbs. The following pressure-temperature relation chart will give you the equivalent temperatures for your gauge pressures:

GAUGE PRESSURES
TEMPERATURE EQUIVALENTS
FOR FREON (F-12)

Lbs. Gauge	Temp.
0	-23 degrees
2	-20 "
4	-11 "
6	-7 "
8	-2 "
10	$+2$ "
12	6 "
14	9 "
16	13 "
18	15 "
20	19 "
25	26 "
30	32 "
50	52 "
75	74 "
100	90 "
115	99 "
130	107 "

For a given B.t.u. load, the size of motor will be the same for any gas. However, I take it for granted you are referring to the case of converting a machine from SO₂ to Freon, in which case the size of the motor would have to be increased. However, in doing so, the capacity of the machine is also increased proportionately.

I see no reason why you should replace an alcohol solution with a calcium chloride brine, unless it is because in your particular application, the compartment containing it is not absolutely tight, and the odor of alcohol is objectionable. I would consider that alcohol and water, in most cases, would be a better brine to use since there is less

danger of electrolytic action and the rusting of iron parts.

Making your own dehydrator, in my opinion, does not pay, and will very often cause you trouble, which will cost much more than the original dehydrator. However, if you have your own reasons for wanting to do this, I would suggest that it be made from a pipe nipple of say 10" length and about 1½" or 2" diameter, depending on the size of the installation, with pipe caps screwed on each end.

In assembling the unit, a pad of about 1½" of steel wool should be placed in each end, and a screen of approximately 120 mesh placed over the steel wool, which will act as a means of preventing particles of

the dehydrant from washing through the dehydrator. Connections, of course, can be drilled and tapped on each end of the pipe caps.

As the temperature of a liquid is reduced, so the specific gravity is reduced. In other words, the liquid becomes thicker and flows more sluggishly. This may be noticed very readily with lubricating oils. If the oil is cold, it will flow very slowly, but as it is heated, this flow will increase. This, perhaps, is the reason why your brine tank leaks when the brine is warm, but stops as the temperature is reduced.

I know of no way in which you can stop small leaks other than draining the compartment and soldering from the inside.

First All-Industry Exhibition Introduces 1939 Lines

THE First All-Industry Refrigeration and Air Conditioning Exhibition, sponsored by the Refrigeration Supplies and Parts Manufacturers' Association, and held at the Stevens Hotel, Chicago, January 16-19, inclusive, proved to be an outstanding success for both the exhibitors and attendants.

The total registration for the four days, consisting of all classifications, was over 6,200. Attendance included among others, agents, factory engineers, service engineers, etc., and exhibitors reported considerable business transacted.

Both the Refrigeration Supplies and Parts Manufacturers' Association, and the National Refrigeration Supply Jobbers' Association held their annual meetings during the course of the four days. In addition to other business transacted, the election of officers took place. Those elected were as follows:

Refrigeration Supplies and Parts Manufacturers' Association

J. S. Forbes, Superior Valve & Fittings Co., Pittsburgh, Pa., *President*.

H. V. Higley, Ansul Chemical Co., Marinette, Wis., *Vice-President*.

E. A. Vallee, Automatic Products Co., Milwaukee, Wis., *Treasurer*.

R. M. McClure, Chicago, Ill., *Executive Secretary*.

Board of Directors

W. C. Allen, Modern Equipment Corp., Defiance, Ohio.

E. W. McGovern, R. & H. Chemicals Dept., Wilmington, Del.

J. D. Colyer, Wolverine Tube Co., Detroit, Mich.

W. A. Leonard, Imperial Brass Mfg. Co., Chicago, Ill.

M. R. Oberholzer, L. H. Gilmer Co., Philadelphia, Pa.

F. B. Riley, Riley Engineering Corp., Detroit, Mich.

D. H. Daskal, Perfection Refrigeration Parts Co., Harvey, Ill.

Edw. Gammie, Victor Mfg. & Gasket Co., Chicago, Ill.

R. H. Luscombe, Penn Electric Switch Co., Goshen, Ind.

National Refrigeration Supply Jobbers' Association

L. H. Gorton, Machine Tool & Supply Co., Tulsa, Okla., *President*.

F. H. Langsenkamp, Jr., F. H. Langsenkamp Co., Indianapolis, Ind., *Vice-President*.

H. W. Blythe, H. W. Blythe Co., Chicago, Ill., *Secretary-Treasurer*.

Irving Alter, Harry Alter Co., Chicago, Ill., *Assistant Treasurer*.

R. W. Burton, Chicago, Ill., *Acting Executive Secretary*.

Board of Directors

C. E. Borden, A. E. Borden Co., Boston, Mass.

A. H. Holcombe, Jr., Victor Sales Co., Philadelphia, Pa.

H. H. Hubbell, Brass & Copper Sales Co., St. Louis, Mo.

F. A. M. Dawson, Resco, Ltd., London, Ont., Canada.

T. W. Binder, T. W. Binder Co., Newark, N. J.

D. C. Lingo, D. C. Lingo Co., Houston, Tex.

H. W. Merkel, Merkel Bros Co., Cincinnati, Ohio.

C. F. Pratt, California Refrigerator Co., San Francisco, Calif.

L. T. Roberts, Forslund Pump & Machinery Co., Kansas City, Mo.

One of the features of the Exhibition was the "Exhibition Review," a daily paper published by the Utilities Engineering Institute during the show. It contained a complete description of exhibits and events, together with many interesting news items and personals pertaining to the show and its attendants.

One hundred individual firms, occupying 180 booths, presented an interesting and educational display. About fifty per cent of them displayed for the first time, new products or improvements on their old products. A detailed description of some of the new products follows:

New Devices and Improvements Shown at Exhibition

PEERLESS OF AMERICA, INC., CHICAGO, ILL., exhibited for the first time the following new products:

A new Powered Flash Cooler using the new "Thermek" Coil cooling surface. It is used in walk-in coolers and is operated by a fan which blows the air over the new coil down through the louvers. It is similar to their regular Flash Cooler except for the compactness and the fan.

A new low temperature Unit Cooler, which is a blower type unit cooler with a radiant heat defroster. The radiant heat defroster will defrost a cooling unit with less time and less current than any present conventional electrical defrosting system.

With the radiant heat defroster, the generated heat radiates to the cooling surfaces and readily defrosts the surfaces thereof, without throwing a large amount of heat into the cooled room.

A Modifier for seasonal humidity control. This control is used similar to their Synchro Fan Control except that it has a summer and winter position switch which governs the speed of the blower on the fan in any particular box.

So many stores such as butcher shops are not heated in the winter time that this control is ideal for such installations. The Synchro Fan Control which they also make, but is not new this year, also cuts the speed of the fan in half on the unit cooler when the ice machine automatically shuts off. The Modifier in the summer time does the same,

but when it is switched over to winter position, it automatically controls the fan unit motor so that it operates at a reduced speed when the compressor is in operation. This results in the cool air being carried at a reduced humidity and the on-time cycle of the compressor is also reduced.

A new line of Model VS Adjustable Expansion Valves.

Along with their present line of the V Models, a new Non-adjustable Expansion Valve Model VN; a new Automatic Expansion Valve VA; a new Removable Orifice Cartridge; a new Constant Pressure Valve Model VT and a new type Peerless Water Saver.

RANCO, INC., COLUMBUS, OHIO, manufacturers of household and commercial controls, exhibited a complete line of standard production household and commercial controls. 1939 evaporators of various leading refrigerator manufacturers were shown. All of these evaporators were equipped with Ranco's latest single dial, stainless steel controls.

However, the spotlight of the exhibit was focused on the new type "G" all-purpose commercial control. This entirely new designed control is adaptable to pressure and temperature, or heating or cooling. It is made for use on all refrigerants. The unit is small and compact and has a heavy black enameled pressed steel case with two adaptable mounting brackets. The control has a



... FEEDERS

... FEEDERS

leads the Parade
with

**NEW PRODUCTS
NEW FEATURES
NEW ECONOMIES**

and Complete
Distribution by
Jobbers Who Stock

TO GIVE YOU
WHAT YOU NEED
WHEN YOU NEED IT



FEDDERS MANUFACTURING CO., BUFFALO

ATLANTA • BOSTON • CHICAGO • CINCINNATI • DALLAS • DETROIT • LOS ANGELES • NEW YORK • PHILADELPHIA



low differential, with positive pressure wide break contact switch mechanism. Toggle mechanism and the spring are made of rust-proof stainless steel. Extra large fine silver contacts give unusual current capacity and long life. Overload protection and signal pilot light circuit and magnetic blowout can be furnished if desired on this new type "G" control.

The new unit made a big hit at the exhibition and the manufacturer states that orders already received from distributors and dealers strongly indicate that this all-purpose commercial control is going to be one of the most popular ever developed.

SUPERIOR VALVE & FITTINGS CO., PITTSBURGH, PA.—Type HE manifolds with built-in heat exchanger, regular heat exchangers, diaphragm packless valves and non-chattering check valves were the principal new items on display by Superior Valve & Fittings Co., manufacturer of refrigeration valves, manifolds, accessories and fittings, according to K. M. Newcum, Sales Manager.

Of outstanding interest at Superior's booth was the miniature refrigeration system in operation, with a Superior Cat. No. 4HE-48S manifold with built-in heat exchanger installed between the evaporator and condensing unit.

To show the increase or superheating effect—average 20 degrees F.—of the heat exchanger on the suction gases, a dial thermometer was attached to the suction where it entered the manifold, with a second thermometer indicating the temperature at the outlet of the heat exchanger manifold. The liquid temperature reduction, which also averaged 20 degrees F., was indicated by two dial thermometers, one of which was attached to the liquid line entering the exchanger manifold with the second thermometer located between the exchanger and the evaporator.

This demonstration, pointed out Mr. Newcum, enabled refrigeration service engineers to see for themselves the liquid temperature reduction and superheating effect of the built-in heat exchanger, which is somewhat revolutionary in design, making its first formal appearance at this Show.

Also of unusual interest was the Superior diaphragm packless valves, which to prove the pressure retaining ability of the patented expansible pressure cups, were operated the duration of the Show in the miniature refrigeration system with the diaphragms removed.

Mr. Newcum explained his reason for operating the valves without the diaphragms was because a serious minded service engineer who wanted to know the facts (not sales talk) called his bluff when he pointed out that the pressure cups would not leak

refrigerant to the atmosphere should the diaphragms fail. The demonstration was very convincing of Mr. Newcum's claims.

Other items displayed were packed line valves with seal cap, liquid indicators, flanged compressor valves, angle valves, and fittings.

ROTARY SEAL CO., CHICAGO, ILL.—An indication of the great popularity of Rotary Seal Replacement Units was the keen interest displayed by everyone interested in refrigeration service work in the new features of construction announced by the Rotary Seal Company at the recent Air-Conditioning and Refrigeration Exposition.

Practically every service engineer is acquainted with the particular seal ring design used for a number of years in the KF-1505 Rotary Seal Replacement Unit and all who found that this same design will now be used in most of the other items in this complete line of replacement seals feel that this change will make Rotary Seal Replacement Units more than ever before the ideal way of repairing compressor shaft leaks. Besides this change to the newer type of seal ring design, unusual attention was paid to the new method used in incorporating the Rotary Seal in compressors originally equipped with slotted or under-cut shafts. By using a sleeve gasketed to the shaft shoulder by a neoprene washer, a new smooth surface is provided on which the seal is then installed.

Making these worth-while changes and refinements and at the same time lowering the price is in keeping with the company's policy of giving the service engineer the most dependable shaft seal and the utmost in value.

VICTOR MANUFACTURING & GASKET CO., CHICAGO, ILL., introduced their latest catalog, which is distributed to their jobbers. Together with the catalog, they introduced the most recent innovation in the boxing of gaskets in sets. Through this method of merchandising, it is possible for the jobber to supply the service engineer with all the gaskets necessary to service any particular model of compressor. The gaskets are purchased in one unit packages. This idea seemed to take very well with the trade.

JARROW PRODUCTS CORP., CHICAGO, ILL., introduced during the show, a new silver-covered gasket with sponge rubber core. This gasket has a great resistance to greases and to abrasive wear. Also featured was the new grease-proof gasket, made of synthetic rubber on a fabric backing. This gasket is impervious to greases and lactic acids, etc.

AUTOMATIC PRODUCTS CO., MILWAUKEE, WIS., displayed their improved Model 205 thermostatic expansion valve.

This valve is now made a great deal simpler in its assembly and operation. One of its main features is the ease with which it can be disassembled for cleaning.

TECUMSEH PRODUCTS CO., TECUMSEH, MICH.—The big four 1½ to 3-hp. condensing units occupied a large part of the Tecumseh Products display. These units are all of the four-cylinder V-type, designed for commercial refrigeration and air conditioning applications. Also displayed for the first time was the new Tecumseh single and twin-cylinder hermetically-sealed units, which are for sale to manufacturers of completed equipment.

CHICAGO-WILCOX MFG. CO., CHICAGO, ILL.—In the Chicago-Wilcox exhibit at the All-Industry Exposition, gaskets for all the popular makes of refrigerating units could be found on display. One of the most recent developments displayed at this time was the packaging of gasket sets. The idea is designed to aid the jobber and service engineer in securing all the proper gaskets for any individual compressor. Catalog numbers shown in the Chicago-Wilcox catalog are all original manufacturers' numbers. When the service engineer requires gaskets for a particular make of compressor, all it is necessary to do is supply his jobber with the compressor number or style, and the jobber can supply him with a package containing all the gaskets used on that particular model.

All packages obtainable at date are listed in Catalog No. 30. If you do not have this number in your file, write the company direct for it.

L. H. GILMER CO., PHILADELPHIA, PA., concentrated their display to featuring the familiar Gilmer belt, the Gilmer belt catalog, which they feel leads the industry in belt listings, and the counter catalog stand, which is sold at a nominal price for the convenience of their jobbers.

JAS. P. MARSH CORP., CHICAGO, ILL., displayed for the first time the new Marsh Serviceman Recorder. This instrument is a small, compact recording thermometer, measuring overall only 5x6x2½ inches. It is built to the same high standards found in the large Marsh recording instruments. A bi-metallic spiral of advanced design is used in the temperature recorder. Zero adjustment is conveniently made by a screw, which follows the idea of the Marsh "Recalibrator." The chart is rotated by an accurate, fully adjustable clock movement, wound by a convenient knob extending through the back of the case.

Temperature ranges obtainable are:
-20 degrees to + 25 degrees with one-degree divisions



MARSH SERVICEMAN RECORDER

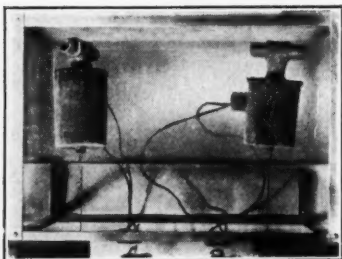
- 0 degrees to + 45 degrees with one-degree divisions
- +15 degrees to + 60 degrees with one-degree divisions
- +45 degrees to + 90 degrees with one-degree divisions
- +20 degrees to +110 degrees with two-degree divisions

The instrument comes equipped with 50 charts, ink and ink dropper, all packed together in an attractive, durable box.

HENRY VALVE CO., CHICAGO, ILL.—Featured in the Henry Valve Co. exhibit were the new permanent mold iron and forged steel compressor and receiver shut-off valves. Prior to this showing, most valves of this type have been of forged brass. Henry Valve Co. is introducing these new materials in this particular product.

ALCO VALVE CO., ST. LOUIS, MO., introduced a new multi-outlet thermo valve, which revolutionizes all previous conceptions of distribution efficiency and offers a higher operating efficiency than ever before. Also introduced was their entirely new line of magnetic valves. Details of the exhaustive performance tests conducted on this new line have just recently been released. Each valve has been subjected to more than 25 breakdown tests. The valves will operate satisfactorily under water, at reduced voltage, at higher maximum pressure differentials and under very severe on and off service.

A series of breakdown tests proved that the valve will operate at least 850,000 times without failure of any parts. This has been calculated to equal a life of eight years at twelve operations per hour, 365 days a year.



TESTING THE COILS UNDER WATER.

In the average installation, this equals a valve life of ten years.

Tests on the powerful coil used in these valves proved that the coil will stand up indefinitely with the current on continuously and with the valve plunger block closed so that the magnetic circuit is incomplete. Further heat tests showed the ability of the valves to hold up under widely fluctuating voltage conditions.

The magnetic coil and the General Electric Flamenol leads in each valve are completely waterproof, eliminating failures due to the condensation of moisture when valves are installed in low temperature or high humidity rooms. A special test was made to prove the ability of these valves to withstand moisture. Valves were placed in service and kept under water for more than six months with the current of the coils alternately on and off. Even under this severe condition, there were no coil failures, proving that here at last are magnetic valves with really moisture proof coils. Each valve is equipped with a kick-off spring, which eliminates residual magnetism difficulties and assures quick-closing under all conditions. A series of tests were run in which a quantity of very low grade oil was placed in the valve and a series of operating cycles were run at various load temperatures. At temperatures as low as minus 50°, these valves closed quickly even with an excess of poorer oil in the valve.

All valves developed their full rated capacity at a pressure drop of only two pounds. This low pressure drop assures maximum capacity with a minimum of flash gas, a fact of particular importance when the magnetic valve is installed ahead of the thermostatic expansion valve. Tests showed that no actual pressure drop is necessary to open these valves; in fact they were actually opened without any flow.

The new line of Alco magnetic valves includes the Types SM and R, and are available for liquid and suction line refrigerant control for Freon, methyl chloride and ammonia. Valves of the new type are also available for brine, steam, water, air and gas. Full details of this latest addition to the Alco line with capacities ranging from 2 to 75 tons may be had from the Alco Valve Company, 2628 Big Bend Blvd., St. Louis, Missouri.

WRENCHES THAT OFFER DOUBLE SERVICE

MORE wrenches in less space are provided the refrigeration service man in this complete set of combination Boxocket and Open End wrenches manufactured by Snap-on Tools Corporation of Kenosha, Wisconsin.

These wrenches are particularly adapted to refrigeration service work, providing the mechanic with a complete set of Boxocket wrenches and a complete set of Open End



THE DOUBLE SERVICE BOX-OCKET SET

wrenches in one handle series, thus effecting a great saving in original cost and also in wrench weight and space. The two latter features will be especially appreciated by many service men who have to carry their tool equipment around with them and want everything as compact and convenient as possible.

The Boxocket Ends come in mighty useful for breaking tight nuts loose or pulling them tight or for working over nuts with long, protruding bolts on which socket wrenches cannot be used, while the Open Ends are more convenient for turning flare nuts, etc.

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A FEW OF THE BOOTHS SHOWN AT THE EXHIBITION.

REFRIGERATION SERVICE ENGINEERS' SOCIETY

Official Announcements of the activities of the National Society and Local Chapters appear in this department as well as articles pertaining to the educational work of the Society.

FIRST ANNUAL WINTER MEETING OF THE ILLINOIS STATE ASSOCIATION

THE first annual winter meeting of the Illinois State Association of the R.S.E.S. was held in conjunction with the All-Industry Refrigeration and Air Conditioning Exhibition at the Stevens Hotel, Chicago, during the week of January 16 to 19, inclusive. Wednesday, January 18, was designated as R.S.E.S. Day, and devoted entirely to a luncheon and two meetings during the day, and a dance and entertainment during the evening.

The first meeting of the day was called to order by State President Leonard Nelson. A few minutes at the opening of the meeting were devoted to some of the business to be conducted by the Association, and then Mr. Nelson turned the meeting over to Chairman Willis Stafford. Mr. Stafford read his prepared paper on "Chapter Programs and How to Arrange Educational Features of the Chapter Meetings." A discussion of the subject followed, with a few questions answered by Mr. Stafford, and a few added suggestions were made. It was requested by those attending the meeting that this paper be sent in bulletin form to the presidents of each chapter. Arrangements are being made to carry out this suggestion.

B. E. Seamon Tells His Experiences.

Mr. B. E. Seamon presented a paper based on his 16 years' experience as Secretary of the Chicago Section of the A.S.R.E. According to Mr. Seamon's experience in association work with the A.S.R.E., their problems in many cases are identical with those of the R.S.E.S. and, due to his many years' experience in this field, he was able to offer many useful and helpful suggestions.

Mr. H. T. McDermott, national secretary of the R.S.E.S., was next on the program. His paper outlined, in general, some of the work already accomplished by the National Society, and its aims and program for the

future. One must realize what a tremendous amount of work lies before the Society to complete the various points of this program, as enumerated by Mr. McDermott.

The balance of the morning was devoted to informal discussions. Many useful suggestions were made during this discussion, and it was generally felt that a lot of very helpful information had been derived from the meeting.

The morning meeting adjourned, and a luncheon meeting took place about one hour later. This was followed by the afternoon session, which was devoted entirely to educational and entertainment features.

The Afternoon Meeting.

After opening the meeting, State President Leonard Nelson turned it over to Chairman Willis Stafford, who immediately introduced National President Claude Brunton. Mr. Brunton, in turn, introduced the other National Officers present, and made remarks suitable to the occasion.

The first feature of the afternoon program was an interesting analysis and talk on the subject of "Sales in Service," by Mr. R. L. Tyler, of the Tyler Fixture Co. Mr. Tyler stated that they had endeavored to merchandise their product to a large extent through the smaller independent service organizations, and went on to analyze and compare some of the advantages and weaknesses to be found in both the small service organizations and the larger sales organizations. He thoroughly discussed and pointed out many items of extreme interest to the man who endeavors to do the double job of selling and servicing, finally making worthwhile recommendations for his future guidance.

Next on the program was the showing of the film entitled "Chapter Activities," by Mr. Herman Goldberg. Mr. Goldberg, for the past year, has been actively engaged in taking movie shorts of R.S.E.S. doings in all parts of the Middle-West. He does it entirely at his own expense as a hobby. To those who see these pictures most often, it

is interesting to note that he always has something new to show. Herman claims it would take over three hours to show all of the pictures he has taken.

Mr. E. W. McGovern, of R. & H. Chemicals Dept. of E. I. duPont de Nemours & Co., was introduced next, and presented his paper on the general subject of "Moisture in Refrigerating Systems." The paper was of considerable length, but Mr. McGovern touched on only its highlights, due to the limited time allotted to him. The paper, in full, will be published at a later date.

Mr. A. F. Briesse, nationally-known author and lecturer, was a guest speaker of the meeting, and presented a humorous version of an Englishman's view of this country. This talk presented quite an enjoyable contrast to the more serious and weighty discussions which had gone before, and was very much enjoyed at this point in the meeting.

The next educational paper of the meeting was that of Mr. Willis Rees, of the U. S. Gypsum Co., on the subject of "New Methods of Insulation." This discussion gave an outline of effective methods of insulating refrigerated rooms, and rather a detailed description of how these rooms may be built. The paper, in full, will be published at a later date.

The afternoon session adjourned at approximately 5:30 p.m., which permitted those members who visited the exhibition primarily for the purpose of attending the R.S.E.S. meetings, to take the opportunity of seeing the huge exhibition, which was the main feature of the show.

Starting at approximately 9:30 p.m., the final feature of the R.S.E.S. Day was the entertainment and dance held in the Boulevard Room of the Stevens Hotel. A large attendance was present, and a very enjoyable floor show was the first feature of the evening. This was followed by dancing until the small hours of the morning.

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NEW CHAPTERS FORMED AT WINNIPEG, CANADA AND SOUTH BEND, INDIANA WINNIPEG CHAPTER

AFTER enthusiastic work by Mr. John B. Shepherd and others in interesting service engineers in Winnipeg and vicinity in a local chapter, ten individuals presented a petition for a charter for Winnipeg Chapter No. 1.

The formation of Winnipeg Chapter makes the fourth organization in the Dominion of Canada, and in a recent letter Mr. Shepherd stated that many inquiries had been received from prospective members who desire to affiliate with this new organization.

Regular meetings will be called immediately after the charter has been granted, and a cordial invitation is extended to service and installation engineers in the vicinity of Winnipeg to communicate with Mr. John B. Shepherd c/o Refrigeration and Appliance Service Co., Ltd., Portage and Spence Sts., Winnipeg, Manitoba, Canada; phone 35700.

The charter members include: R. F. Castling, Frank Chance, Albert Hall, James E. Lightheart, W. N. Seaman, J. B. Shepherd, E. J. Short, Ted Starke, James Steele and J. B. Thickson.

§ § §

MICHIANA CHAPTER NO. 1

AT a meeting called on November 28th, at which National Secretary H. T. McDermott was present to explain the purposes and objects of the National Society, a group of service engineers applied to the National Society for a charter for a chapter to be known as the Michiana Chapter No. 1 of South Bend, Indiana.

This new chapter expects to receive its charter at an early date and invites the participation of service engineers in the vicinity of South Bend to attend its meetings. The charter members comprising this chapter include:

S. Belknap
H. K. Bowman
H. F. Bryan
C. S. Casselman
D. F. Crissler
M. E. Deal
T. L. Driskell
L. DeMeulenaere
R. K. Gill
G. E. Gushwa
E. E. Hatfield
A. N. Johnson
L. D. Lane
L. L. Leyman
L. E. McKee

P. A. McKee
C. R. McMurray
A. B. Miller
T. T. Nowak
C. C. Paskell
J. A. Pechi
W. L. Ranger
Paul Shapiro
O. W. Towne
E. E. Ullrey
J. F. Woveris
G. Yeager
N. J. Zellmer
H. E. Zerbe

The following officers have been selected for the new chapter: *President*, J. A. Pechi; *First Vice-president*, R. K. Gill; *Second*

Vice-president, T. L. Driskell; Treasurer, E. E. Ullery; Secretary, Leo McKee; Chairman, Educational Committee, H. E. Zerbe.

§ § §

REFERRED TO MR. ANDERSON

Dear Mr. Editor:

Knowing your intense desire for truthfulness in all published statements, I call your attention to a recently published picture of Mr. Robert Anderson with a sail fish presumably caught by the aforementioned Mr. Anderson. I am not questioning the fact that this picture shows Mr. Anderson or the charming Mrs. Anderson, but I am reliably informed that this same fish which is hired by the season by the Chamber of Commerce has appeared in thousands of pictures of so-called fishermen.

Mr. Anderson who sells Imperial products has recently become a member of Des Moines chapter and of course one of our pre-requisites to membership is truthfulness, so we would like to caution Mr. Anderson about his fish stories.

Yours truly

B. F. Wood, Des Moines.



NEWLY-ELECTED OFFICERS OF
PITTSBURGH CHAPTER

Left to Right, Front Row: Vincent C. Waight, first vice-president; John Barbagallo, director; Joseph C. Hipps, director. Back Row: Guy A. Croston, sergeant-at-arms; Frank V. Goltz, secretary; E. Vernon Black, president; Nelson D. Wagener, educational chairman; Albert H. Ross, director.

"SANDY" PRATT, OF SAN FRANCISCO, SELLS CALIFORNIA

"C" FOR California, as well as Clarence "Sandy" Pratt who did not overlook the opportunity of informing the refrigera-

FILTER OUT FUTURE TROUBLE with the NEW

KEROTEST

Type 901 LIQUID FILTER!



ESPECIALLY designed for ice cream cabinet service, the Kerotest Type 901 Liquid Filter is a boon to trouble-free refrigeration operation, combining the double filtering action of an asbestos sack and a fine 100 mesh bronze screen. The liquid refrigerant first passes through the asbestos sack and then the screen, effecting a very efficient filtering service.

Moreover, the *removable* End Flange makes it possible to easily clean the Strainer Assembly in a minimum of time and trouble. A large wrench square on each end and extra long pipe and flare connections complete the design of a thoroughly serviceable Filter. Made in a large variety of pipe and flare sizes. Ask your local Kerotest Jobber, listed at the right, about it.



KEROTEST MANUFACTURING CO.
PITTSBURGH, PA.

FOR QUICK SERVICE



REFRIGERATION PRODUCTS

Phone your nearest distributor

JOBBERS WITH LOCAL STOCKS

Albany, N. Y.	Hoy & Co.	Minneapolis, Minn.	Refrigeration & Industrial Supply Co., Inc.
Allentown, Pa.	General Refrigeration Supply Co.	Minneapolis, Minn.	Vincent Brass & Copper Co., Inc.
Atlanta, Ga.	J. M. Tull Metal & Supply Co., Inc.	Montreal, Quebec, Canada.	Railway & Engineering Specialties, Ltd.
Baltimore, Md.	Bowen Refrigeration Supplies, Inc.	Mt. Vernon, N. Y.	County Seat Plumbing Supply Co.
Baltimore, Md.	Clendenin Bros., Inc.	Newark, N. J.	T. W. Binder Co.
Binghamton, N. Y.	Melchior, Armstrong, Dessau Co.	New Haven, Conn.	Resco, Inc.
Boston, Mass.	Syracuse Equipment Corp.	New Orleans, La.	Encha Sales Co.
Bridgeport, Conn.	A. E. Borden Co.	New York, N. Y.	Aetna Supply Co.
Brooklyn, N. Y.	Parsons Bros.	New York, N. Y.	Melchior, Armstrong, Dessau Co., Inc.
Brooklyn, N. Y.	Coleman Electrical Supply Co., Inc.	New York, N. Y.	The Harry Alter Co., Inc.
Brooklyn, N. Y.	Melchior, Armstrong, Dessau Co.	Norfolk, Va.	Noland Co., Inc.
Buffalo, N. Y.	The Capson Co.	Oklahoma City, Okla.	Midwest Supply Co.
Cambridge, Mass.	Root, Neal & Co.	Omaha, Nebraska	United Supply Co.
Charleston, W. Va.	Melchior, Armstrong, Dessau Co.	Oshkosh, Wis.	Gustave A. Larson Co.
Air Conditioning & Refrigeration Supplies, Inc.		Pateron, N. J.	White & Shauger, Inc.
Charlotte, N. C.	Henry V. Dick Co.	Peoria, Ill.	Wilkins Pipe & Supply Co.
Chattanooga, Tenn.	Noland Co., Inc.	Pittsburgh, Pa.	Williams & Co., Inc.
Chicago, Ill.	H. W. Blythe Co.	Philadelphia, Pa.	Melchior, Armstrong, Dessau Co., Inc.
Chicago, Ill.	Fred C. Kramer Co.	Philadelphia, Pa.	Victor Sales Corporation
Chicago, Ill.	H. Channon Co.	Phoenix, Ariz.	Refrigeration Supplies Distributor
Automatic Heating & Cooling Supply Co.		Portland, Ore.	Bill Helber, Refrigerative Supply, Inc.
Chicago, Ill.	The Harry Alter Co., Inc.	Providence, R. I.	Rhode Island Supply & Eng. Co.
Chicago, Ill.	The Harry Alter Co., Inc.	Rochester, N. Y.	Ontario Metal Supply, Inc.
Cincinnati, Ohio.	The Merkel Bros. Co.	Rochester, N. Y.	Melchior, Armstrong, Dessau Co., Inc.
Cincinnati, Ohio.	Williams & Co., Inc.	Rockford, Ill.	Gustave A. Larson Co.
Cleveland, Ohio.	The Harry Alter Co., Inc.	Sacramento, Calif.	Hinshaw Supply Co.
Cleveland, Ohio.	Williams & Co., Inc.	St. Joseph, Mo.	Bristol Supply Co.
Dallas, Texas	The Electromotive Co.	St. Louis, Mo.	The Harry Alter Co., Inc.
Davenport, Iowa	Republic Electric Co.	St. Louis, Mo.	R. E. Thompson Company
Dayton, Ohio.	The W. H. Kieffaber Co.	Salem, Mass.	Standard Supply Co.
Denver, Colo.	Auto Equipment Co.	Salt Lake City, Utah.	Peerless Utah Co.
Detroit, Mich.	J. M. Ober, Inc.	San Antonio, Texas	Straus-Frank Co.
Fort Wayne, Ind.	H. J. Schroeder Co.	San Francisco, Calif.	California Refrigerator Co.
Greensboro, N. C.	Hasco, Inc.	Seattle, Wash.	Refrigerative Supply, Inc.
Hartford, Conn.	Melchior, Armstrong, Dessau Co.	Sioux City, Iowa.	National Refrigeration Service
Hartford, Conn.	Marsden & Wasserman, Inc.	South Bend, Ind.	F. H. Langenkamp Co.
Hempstead, Long Island, N. Y.	Sid Harvey, Inc.	Springfield, Ill.	United States Electric Co.
Honolulu, T. H.	Theo. H. Davies & Co., Ltd.	Springfield, Mass.	C. P. Payson Co.
Houston, Tex.	Standard Brass & Mfg. Co.	Toledo, Ohio.	The Heat & Power Engineering Co.
Houston, Tex.	Walter Refrigeration Supply Co.	Toronto, Ontario, Canada.	Railway & Engineering Specialties, Ltd.
Indianapolis, Ind.	F. H. Langenkamp Co.	Tulsa, Okla.	Machine Tool & Supply Co.
Jacksonville, Fla.	Jamita Company	Vancouver, B. C., Canada.	Fleck Bros., Ltd.
Kansas City, Mo.	Forslund Pump & Machinery Co.	Washington, D. C.	Refrigeration Supply Co.
Knoxville, Tenn.	Leinart Engineering Co.	Waterloo, Iowa	Winterbottom Supply Co.
London, Ont., Canada.	Refrigeration Supplies Co., Ltd.	White Plains, N. Y.	County Seat Plumbing Supply Co., Inc.
Long Beach, Calif.	L. B. Marsh	Wilkes-Barre, Pa.	Radio Service Co.
Los Angeles, Calif.	Frank Gillett Co.	Winnipeg, Manitoba, Canada.	Railway & Engineering Specialties, Ltd.
Los Angeles, Calif.	Refrigeration Service, Inc.	Worcester, Mass.	Standard Supply Co.
Louisville, Ky.	Louisville Mill Supply Co., Inc.		
Lubbock, Tex.	R. & R. Parts & Supply Co., Inc.		
Macon, Ga.	Lowe Electric Co.		
Madison, Wis.	Gustave A. Larson Co.		
Memphis, Tenn.	United Refrigerator Supply Co.		
Miami, Fla.	Railor-Milam, Inc.		
Milwaukee, Wis.	Refrigeration Specialty Co.		

FACTORY REPRESENTATIVES

Chicago, Ill.
Dayton, Ohio

Detroit, Mich.
Los Angeles, Calif.

New York, N. Y.
Philadelphia, Pa.

St. Louis, Mo.
San Francisco, Calif.

GENERAL EXPORT REPRESENTATIVES

Melchior, Armstrong, Dessau Co., Inc.
300 Fourth Ave., New York City, N. Y., U. S. A.

tion industry in general of the advantages of California. "Sandy" remembered his many friends with gift boxes of California glazed fruit and small redwood trees.

Many of these trees will be planted in various parts of the country, and sometime in the future, a California redwood, sprouting in some other section of the land, will be the result of "Sandy" Pratt's missionary work at the First All-Industry Refrigeration and Air Conditioning Exposition.

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NEW OFFICERS ELECTED FOR DES MOINES CHAPTER

THE group picture shows attendance of members of Des Moines Chapter which met to elect new officers for the current year. The small group is a picture of the retiring president B. F. Wood and Mr. E. J. Kerby and A. J. Milliron.

A short time after these pictures were taken the members of Des Moines Chapter were shocked to learn that their recently elected president, Mr. E. J. Kerby met an untimely death in an aeroplane accident on January 1st. Mr. Kerby, who was service manager of the A. A. Schneiderhahn Co.,



Left to right:—E. J. Kerby, elected President of Des Moines Chapter and killed in plane accident on January 1.

B. F. Wood, retiring President and new Vice President.

A. J. Milliron, elected President after untimely death of Mr. Kerby.

Des Moines distributor, was an aviation enthusiast and student pilot. He lost his life near Sheffield, Iowa. He enjoyed a host of friends in the refrigeration business and his election to the presidency of the recently formed Des Moines Chapter was a testimonial to his ability and the confidence he enjoyed among his colleagues. Mr. Kerby was thirty-two years old and is survived by his mother, who resides in Sioux City, a sister residing in Cedar Rapids, and a brother

FOR COMMERCIAL USE Mills Compressors

★ Mills Novelty Company
4100 Fullerton Avenue, Chicago, Illinois

SOLD ONLY THROUGH SERVICEMEN, DEALERS, AND DISTRIBUTORS



MEMBERS OF DES MOINES CHAPTER WHO WERE PRESENT FOR ELECTION OF OFFICERS

who is a missionary-priest in China.

At a subsequent meeting in which the chapter expressed its condolences to the sur-

living members of the family, Mr. A. J. Milliron, who had been elected vice-president, was advanced to the presidency of the

Ready for You, Now

SECOND EDITION

"ANSUL REFRIGERANTS"



Just off the press—the new 68-page edition of "Ansul Refrigerants".

This useful book needs no introduction to you who received the first edition. Now it has been revised, brought up to date, enlarged—with new charts, new tables, new illustrations. *Write for your copy today.*

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Complete Data on Sulphur Dioxide and Methyl Chloride • Comparison of Refrigerants • Practical Use of Tables and Data • Lubrication • Handling Refrigerants • Measuring Charge • Methods of Temperature Control • Compressor Data • Suction-Line Pressure Drop • Ansul Cylinder Equipment • ICC Regulations • Miscellaneous Data • Useful Formulas • Definitions, etc., etc.

ANSUL CHEMICAL CO.
MARINETTE, WISCONSIN RS-2-9

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USE THIS COUPON...WORTH \$1.00

Ansul Chemical Co., Marinette, Wisconsin
Gentlemen:

Please send me, free, my copy of "Ansul Refrigerants" (Second Edition).

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Snap-on

**SPECIALIZED TOOLS
FOR REFRIGERATION SERVICE**

ONE-STOP SERVICE!

Get quick, efficient, "one-stop service" with the Snap-on Refrigeration Service Set No. R200B (Illustrated). Ratchet plugs, packing gland nut sockets and square valve stem sockets are all included in this valuable set. Every socket and wrench is especially designed to service refrigeration and air conditioning equipment with the least possible effort and utmost efficiency. Carry Snap-on Tools, and give "one-stop service" on all your installation and servicing calls.

Available only through our own branch distributing warehouses located in 35 principal cities. See Snap-on Tools in your city phone directory or write:

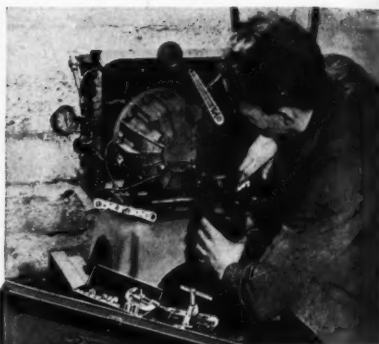


SNAP-ON TOOLS CORP., Kenosha, Wis.

Snap-on
Socket Wrenches

*The Choice of
Better Mechanics*

Blue-Point
Mechanic Tools



R-200B Refrigeration Set

It contains a reversible type ratchet with 3/4" square opening for work on valve stems . . . 1 1/2" extension . . . 3 adaptor plugs . . . 1 Kerolast valve packing nut socket . . . 5 square valve stem sockets . . . 3 packing gland nut sockets, and 7/16" - 1/2" - 9/16" double-broached Hexagon sockets.



chapter, and the retiring president, Mr. B. F. Wood, was elected vice-president.

Other officers for the year are: secretary, E. A. Laverrenz; treasurer, Dave Gasper; sergeant-at-arms, A. H. Siefken.

WALTER ALEXANDER, JR., PASSES ON

MR. WALTER ALEXANDER, JR., who was a charter member of Fox River Valley Chapter, of Fond du Lac, Wisconsin, passed away on January 10th.

Mr. Alexander was employed in the service department of the Linden Electric Co. of Fond du Lac. He was born in Pipestone, Minnesota.

MEMPHIS CHAPTER CHANGES NAME TO CHICKASAW CHAPTER

IN the election of new officers for the chapter at Memphis, Tennessee, the name of the chapter has been changed to Chickasaw Chapter No. 1, and the following officers elected: *President*, H. G. Thompson; *Secretary-Treasurer*, J. H. Riehlmann; *Educational*

Committee Chairman, W. C. Easley.

Many members of the National Society will recall many of the individuals comprising Chickasaw Chapter who have been responsible for the reorganization of the chapter under its new name during the past several months, and these members include: R. F. Weidlein, B. L. Bridges, W. C. Easley, Boyd Evans and W. Hall Moss, past national president.

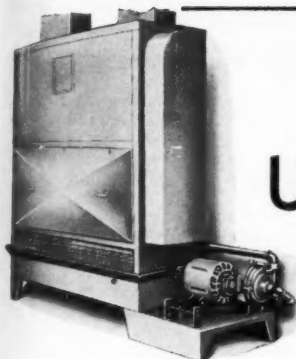
Plans are being made for an active program for the future educational activities of the chapter.

Chapter Notes

Under this heading will appear news of the chapter meetings. For names of the officers and dates of regular meeting nights, please refer to the Chapter Directory.

MISSISSIPPI VALLEY CHAPTER

December 19—The major part of the evening was devoted to discussions relative to the third annual banquet and entertainment which is to be held on Saturday evening, February 18th. Tickets will be sold at the rate of \$1.50 per plate and the banquet will be held in the Blackhawk Hotel.



FLOOR TYPE UNIT COOLERS *by Marlo*

Self-contained. Self-defrosting. Specially designed for Locker Storage Rooms, Marlo Unit Coolers may be used in any refrigerator—

For room temperatures 35 degrees and up, water is sprayed over the coil for defrosting.

For room temperatures 5 degrees to 35

degrees, salt or calcium chloride is used.

For room temperatures below plus 5 degrees, calcium chloride or any other low temperature brine solution may be used for defrosting coil.

Also for use in cold storage rooms where temperatures and moisture conditions make defrosting a problem.

Write for new Bulletin 393, and prices

MARLO COIL CO., 6135 Manchester Ave., St. Louis, Mo.

MANUFACTURERS OF COMPLETE LINE OF LOW SIDE EQUIPMENT

X-1R2

Some consideration was given to the production of a souvenir booklet; however, no definite arrangements were made on this matter and it was tabled for the following meeting. To carry out these arrangements, the following committees were appointed: General Committee, Advertising Committee, Booklet Committee, House Committee, Entertainment Committee and the Ticket Committee.

As the Ladies Auxiliary was meeting at the same time as the men, the ladies were invited to be present and help the men plan the third annual banquet. Mrs. Berberet had a fairly complete program of entertainment ready for presentation, which was considered quite adequate.

January 13—Since this was the first meeting of the year, the election of officers was the main order of business. Some discussion followed as to how it was to be conducted and it was finally decided that should be done by secret ballot. The final results were as follows: *President*, L. C. Nelson; *Vice-president*, C. L. Hartman; *Secretary*, E. L. Bengston; *Treasurer*, Fred Tindall; *Sergeant-at-arms*, E. M. Dick; *Directors*: C. A. Teagarden, H. A. Willetts and E. M. Dick.

Following the election, further plans for the third annual banquet were discussed, with reports from the banquet committees being given on their progress to date.

SPRINGFIELD CHAPTER

December 14—A discussion was held and arrangements begun on the future party and dance to be held on January 28th. A decision was reached to sell tickets in the amount of \$1.00 per plate for the dinner preceding the dance.

For the educational program of the evening, Mr. A. Fait gave an interesting discussion on No. 1 of the National Lecture Course bulletins. It is the plan of the chapter to go through the entire set of Lectures issued to date, making a total study of each one.

January 11—An election of officers held at this meeting resulted in the following: *President*, R. M. Potter; *First Vice-president*, S. Grosberg; *Second Vice-president*, J. J. Kline; *Secretary*, A. L. Hammond; *Treasurer*, F. W. Nichols; *Sergeant-at-arms*, R. B. Westenberg; *Directors*: D. E. Greig, R. S. Dobbins, E. A. Bopp and P. W. McVay; *Chairman of the Educational Committee*: C. F. Linderman.

Mr. P. W. McVay, the retiring president, gave a parting message on leaving the chair and turned the gavel over to the newly elected president, R. M. Potter.

President Potter's first duty was to appoint an Auditing Committee, consisting of Messrs. J. J. Kline and K. F. Beatty.

CHICAGO CHAPTER

January 10—After a short session of business, during which correspondence and reports and minutes of the last meeting were read the Nominating Committee was asked to retire and make its selection of officers to be elected for the coming year.

During the absence of the Committee, Mr. Mel W. Knight gave a brief resumé of what could be expected at the All-Industry convention to be held at the Stevens Hotel during the week of January 16th to 19th.

After the Nominating Committee had announced its selections and additional nominations had been received from the floor, voting proceeded in the usual manner, with the result that the following were elected for the coming year: *President*, John Barksdale; *First Vice-president*, H. J. DeGan; *Second Vice-president*, Steve Archie; *Secretary*, Nick Clement; *Treasurer*, Paul C. Krueger; *Sergeant-at-arms*, Peter Bendl; *Directors*, Fred Twiss, Fred Roth, J. Kacin, Jr., M. W. Knight and E. W. Scotten.

Introduction of the new officers and speeches by the retiring officers were in order following the election.

The new president, Mr. J. Barksdale, then took over the chair, expressing his gratitude and appreciation of the confidence the mem-

bership had shown him in electing him as their new president.

ROCKFORD CHAPTER

January 16—The meeting was called to order by President R. C. McCarthy. In keeping with the chapter's new feature of a bank night, drawing for the prize was conducted, with Mr. William Oderheimer as the winner.

The Dance Committee reported that the Harrisville Grange Hall had been reserved for February 11th. The entertainment is to be known as the Valentine Dance.

The educational program for the evening consisted of a talk by Mr. Edwin Bates of Rockford, who discussed very thoroughly the subject of air conditioning of automobiles.

PONY EXPRESS CHAPTER

January 3—The meeting was called to order by President E. J. Storm, and since there was very little other business to be conducted for the evening, the greater part of it was spent for the election of officers. The election was carried out in the usual manner by the Nominating Committee, who made its recommendations, after which additional nominations were made from the floor. After a vote was taken and the final count made,

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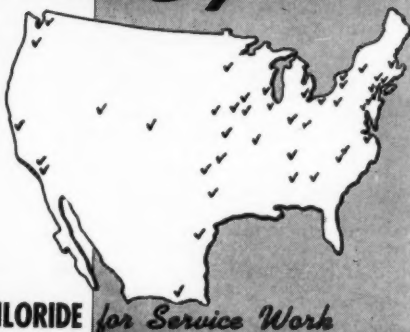
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the results were shown to be as follows: *President*, E. J. Storm; *Vice-president*, John Stilgenbauer; *Secretary*, H. E. Young; *Treasurer*, Harold Canfield; *Sergeant-at-arms*, J. Wegenka; *Directors*: W. B. Nichols and Bruce Mercer; *Educational Committee*: R. L. Myers, *chairman*, J. Stilgenbauer, J. Wegenka and H. O. Bruess.

A short educational meeting was conducted following the election of officers.

CENTRAL INDIANA CHAPTER

January 10—This meeting was devoted to the annual election of officers, which resulted in the following: *President*, F. Whetsel; *Vice-president*, William Sevy; *Secretary*, Vern Nold; *Auditing Committee*, Paul Jacobsen and Bob Morris; *Directors*: Bob Morris, Herbert Hale and J. R. Rogers; *Chairman, Educational Committee*, Paul Jacobsen; *Chairman, Membership Committee*, J. R. Rogers.

Following the election, announcement was made that the next meeting would be held on January 24th, and from then on they would be held every first and third Tuesday of each month until further notice.

The retiring president, Mr. J. L. Rogers, was especially commended for his thoughtfulness to his position during the past year. Mr. Rogers is an elderly man—a charter

member of the chapter—and trips of thirty-five miles in rain, snow or ice have never kept him from a meeting.

Mr. Paul Jacobsen gave a very interesting talk on how to better chapter meetings. Everyone agreed that if followed out the suggestions should bring fine results, and pledged themselves to do so.

January 24—The meeting was called to order by Vice-President William Sevy, and was held in the Indiana General Service Building at Marion. The usual business of the evening was conducted, and since the hour was still quite early, the meeting was adjourned and an informal gathering was entertained by tales of what had happened at the Chicago All-Industry convention during the week of January 16-19. Mr. P. Jacobsen, Bill Sevy and Donald Schaeffer were all in attendance and all contributed their views of the convention.

Mr. Floyd Duvall of the Mills Novelty Company was a guest of the evening and spoke at length on improvements for 1939 over 1938.

MADISON CHAPTER

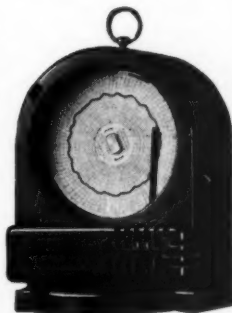
December 6—Since this was the last meeting of the year and the next meeting would be the election of officers, acting-president J. Quam appointed Mr. A. L. Robertson chair-

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man, and Mr. Ray Sweeney and Otto Johr as members of the Nominating Committee with instructions to select those who in their opinion would be best qualified to fill the chapter's offices for the coming year.

Mr. Knute Spilde displayed a line screen taken from a Norge household refrigerator which was plugged with what at first glance appeared to be sand, but what at closer examination seemed to be a combination of SO₂, carbon and oil. Mr. Spilde announced his intention to have the sediment analyzed and to give a report at the following meeting.

At this point Mr. Herman Goldberg, who was supposed to have been in attendance but who had not shown up, was found together with about six of the chapter members in the old meeting room. Mr. Goldberg was doing some very fast talking about having such a poor turn-out and wondering when the officers were going to show up. He felt considerably better when escorted to the official meeting room.

On the educational program for the evening, Mr. Art Janeck gave a very fine talk on the origin of oils and their characteristics. This was followed by Mr. Goldberg's presentation of his movies showing chapter activities in the various parts of the middle west.

January 10—It was intended that this meeting should be devoted to the election

of officers, but due to the poor attendance and lack of a quorum, the election was postponed until the next meeting.

Mr. C. Buschkopf, who was a guest of the evening, spoke at length on some of the plans of the National Society for the coming year. He also gave a résumé of what might be expected at the big exposition in Chicago the following week.

Due to an accident, Mr. Schroeder of the White-Rogers Company was unable to attend as scheduled, and Mr. A. Janeck filled in by giving some very interesting information on refrigerant oils.

January 24—This meeting was devoted almost entirely to the election of new officers. Conducting the election in the usual manner, the final results were as follows: *President*, Phil Noth; *First Vice-president*, H. A. Struthers; *Second Vice-president*, Wm. Knueppel; *Secretary*, J. Quam; *Treasurer*, A. Janeck; *Sergeant-at-arms*, Geo. Poster; *Directors*: Otto Johr, Meade Robertson and Knute Spilde; *Chairman, Educational Committee*, G. A. Larson.

On the educational program for the evening, Mr. Schroeder of the White-Rogers Company was introduced and gave a complete explanation of the construction and operation of their hydraulically charged controls. His talk was very much enjoyed by those present.



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MOHAWK VALLEY CHAPTER

January 17—Since this was the first meeting of the year, the main order of business was the election of officers, which resulted in the following: *President*, E. Thomas; *Vice-president*, Wm. Bodmer; *Secretary*, C. W. Pearson; *Treasurer*, James Bracken; *Sergeant-at-arms*, H. L. Cooley.

MILE HIGH CHAPTER

December 14—An interesting meeting was enjoyed on this date, with a very good attendance present.

On the educational program of the evening, Mr. K. G. Custer of the Gates Rubber Company gave an interesting demonstration and discussion on V-belts.

A report was given on the progress of the Mile High bowling team by Tom Alexander, the captain. Mr. Alexander expressed some anxiety about the score of Mr. Ed Huff. Mr. Huff, on November 18th, bowled a score of 218; on November 22nd he became the proud father of a 6½ lb. baby girl; and on November 25th his bowling score fell to 97. Therefore, it was felt that a moral should be derived from this and issued a warning to other team members to see that such things which might affect their scores to such a marked degree be avoided.

CAPITAL CITY CHAPTER

December 7—After the regular run of business for the evening, some discussion followed on the organizing of an Initiation Committee.

On the educational program for the evening a pamphlet was read and discussed by Mr. L. I. Belin on the servicing of ice cream cabinets.

December 21—The meeting was opened by President E. J. Uhthoff, and the usual run of business disposed of.

Three new members were welcomed to membership in the chapter and reports of several more applications were read.

The business meeting was adjourned at a fairly early hour and a social gathering followed, with refreshments being served by Mrs. N. E. Burdette and Mrs. E. J. Uhthoff.

January 4—After disposing of the current business for the evening, President E. Uhthoff appointed a Nominating Committee, and the usual routine of election of officers took place. The results were as follows: *President*, R. M. Todd; *Vice-president*, Wm. Mahrley; *Secretary-Treasurer*, M. H. Hamilton; *Sergeant-at-arms*, F. B. Murray; *Directors*: E. Uhthoff, D. Matheson, W. G. Barber, S. L. Price, H. M. Miller; *Educational Committee Chairman*, N. E. Burdette.

Following the election, acceptance speeches were in order, and the new officers were installed. A vote of thanks was given to Mr. E. Uthoff and the other retiring officers.

MISSOURI VALLEY CHAPTER

December 15—After the usual reading of minutes of the previous meeting, current correspondence, committee reports, etc., an election of officers was conducted in the usual manner, with the following results: *President*, F. C. Haerberlein; *First Vice-president*, Chas. Martinson; *Second Vice-president*, O. F. Larson; *Secretary*, V. E. Kauffman; *Treasurer*, F. B. Ferguson; *Sergeant-at-arms*, Elton Lewis; *Chairman, Educational Committee*, Austin Jones.

Announcement was made that Mr. Elton Lewis had been injured in an automobile accident and it was decided by the membership to send a bouquet of flowers and express the good wishes of the chapter.

LOS ANGELES CHAPTER

December—Since this was the last meeting of the year, election of officers occupied the main part of the evening, and the results

were as follows: *President*, J. C. Rodgers; *First Vice-president*, J. R. Payne; *Second Vice-president*, W. E. Young; *Treasurer*, G. R. McElay; *Secretary*, F. W. Gillett; *Sergeant-at-arms*, W. A. Myers; *Chairman, Educational Committee*, J. C. Blair; *Directors*: W. W. Allison, T. E. Lawler, W. Nadeau, J. H. Underwood, T. A. Matthews.

Due to lack of time, installation of new officers was held over until the first meeting in January.

January 25—This meeting was held at Scully's Cafe, with approximately seventy members and visitors present. The installation of new officers for the ensuing year by President W. W. Allison was one of the highlights of the evening.

Educational Chairman J. C. Blair announced the Vox Pop Question Contest to be held at the February meeting. This announcement was received with a great deal of enthusiasm, and several members volunteered to enter the contest.

TRI-STATE CHAPTER

January 9—In order to clean up the year's business and be able to turn the chapter over to the new officers, President C. A.



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Brunton appointed an Auditing Committee composed of Mr. Joe Peck, chairman, W. Wheatley and Ben DeRoud.

The Nominating Committee appointed at the previous meeting was asked to present its recommendations, and the election of officers followed. The results were: *President*, A. W. Gruber; *First Vice-president*, James Cottle; *Second Vice-president*, F. D. Poole; *Secretary*, A. W. Albertsen; *Treasurer*, John Smoot; *Sergeant-at-arms*, Carl Ackley; *Directors*: W. H. Wheatley, C. A. Brunton, Ben DeRoud, D. M. Young and M. E. Harrison.

Mr. Frame gave some information on educational training classes which he is conducting and his plans for securing equipment for use in the classes.

At the invitation of Mrs. R. McElhane, the meeting adjourned to her home, where a meeting of the Ladies Auxiliary was in progress, and refreshments were served.

January 23—The first order of business of the evening was the installation of the new officers.

Retiring President C. A. Brunton turned the gavel and the charter over to the newly elected President, A. W. Gruber and Mr. Gruber made a few remarks of acceptance in taking over office.

President Gruber asked Mr. Brunton for a report on the All-Industry Convention at Chicago. Mr. Brunton responded with a very fine description of the many features witnessed while in Chicago, including the manufacturers and jobbers exhibits and the meetings of the Illinois State Association.

A discussion on the educational program for 1939 brought out many good suggestions. Among them was that of Claude Brunton in which he suggested that we secure as many of the manufacturers and jobbers movie films as possible. It was further suggested that the chapter purchase a movie projector.

President Gruber extended an invitation to hold the next meeting at his home in Iron-ton, Ohio. This meeting will be preceded by a dinner to be served by the Ladies Auxiliary.

ST. LOUIS CHAPTER

January 12—After the usual reading of correspondence and minutes of the previous meeting, President Vollman explained that the main purpose of this meeting was to elect new officers for the coming year.

Consequently, the Secretary called a roll of all members in good standing and explained

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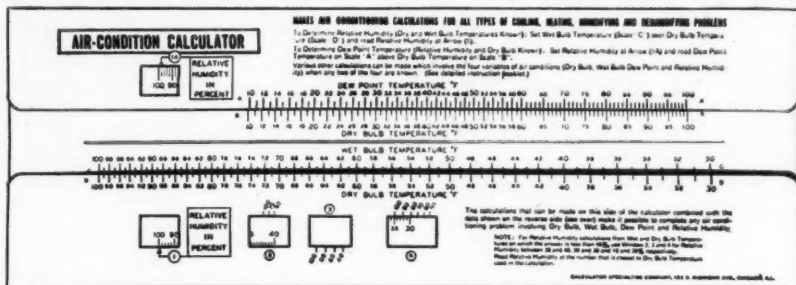
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to them the method to be used in voting. After the Nominating Committee had made the recommendations and further nominations were made from the floor, the election took place, with the following results: *President*, A. H. Huhn; *First Vice-president*, E. C. Fix; *Second Vice-president*, O. E. Petri; *Secretary-Treasurer*, E. A. Plesskott; *Sergeant-at-arms*, Wm. Steinkamp; *Directors*: L. L. Vollman, N. H. Behrend, L. C. Haney; *Educational Committee, Chairman*, E. Gygax.

President Vollman, in turning over the gavel, thanked the members for the privilege of serving them and the cooperation given him during the past year.

Mr. Huhn, in accepting the office as president, pledged himself to do all in his power to make this an outstanding year for the chapter.

Some discussion followed on the desirability of moving the meeting headquarters to some place where parking facilities were better. Secretary Plesskott promised to look into the matter and make a report at the next meeting.

DAYTON CHAPTER

January 6—The newly elected officers were installed in office as the first order of busi-

ness and the new President's first action was to appoint various committee members to carry on the work during 1939.

After the business of the evening was disposed of the meeting was turned over to Mr. H. Shoupp, chairman of the Educational Committee, who presented an interesting evening for all.

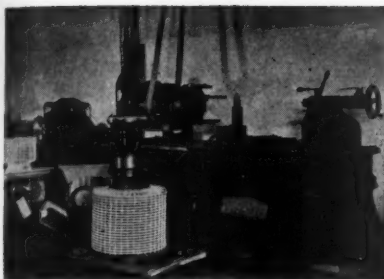
January 20—During the course of the business session of the evening, considerable discussion arose regarding the acceptance of a chapter constitution and by-laws. It was finally decided, however, that the chapter would retain the one as presented by the National Society.

New members were welcomed to the chapter, and additional applications were read.

The Entertainment Committee reported on the advancement of its plans for a Valentine party to be held on February 14th. The party is to be for all members and their families.

KANSAS CITY CHAPTER

December 13—President T. L. Anderson appointed E. Bloesser as a committee of one to make the yearly audit of the chapter's records and books and to have a written report at the following meeting. The Secretary and Treasurer were also asked to sub-



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mit reports of their activities and business for the past year.

The meeting was then turned over to the Educational Chairman, who discussed Lecture No. 16 of the national Lecture Course, which was followed by considerable discussion of questions by those in attendance.

December 28—It was announced by the Entertainment Committee that the annual banquet and installation of new officers would be held on January 25th at the Belerive Hotel. Tickets will be sold at \$1.50 per person to defray the cost of the affair. Dancing will be part of the entertainment, and the banquet will be for members only.

Winners of the membership drive which has been in progress for the past few months will be announced at the next meeting after a detailed check has been made by the committee.

Mr. L. H. Roberts suggested that a tube bending contest be held during the first two months of the year, at which time he promised to secure the cooperation of Mr. Bob Anderson of the Imperial Brass Mfg. Co. This suggestion was well received and was referred to the Educational Committee for further action.

Mr. Ray Ryan was then introduced and he presented his talk on the new Gibson Freon unit. Compressor parts were distributed among the members for their in-



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spection. Mr. Ryan gave several service hints, a diagram of the unit and useful information, together with a general description of the construction and operation of the unit, all of which made the feature very interesting.

WICHITA CHAPTER

December 16—The meeting was called to order by President F. W. Ryan, and after disposing of the chapter's business for the evening, a short discussion on the membership drive which is being planned followed, and a number of good suggestions were received.

Among other things, it was decided that in the membership drive prizes would be awarded to those securing the most members.

It was suggested by Mr. Govits that a portion of the time of each meeting be devoted in the future to the reading of the national Lecture Courses and a discussion of the problems presented therein and that a blackboard be secured to aid in the illustrations of these problems.

CLEVELAND CHAPTER

December 8—The meeting was held at the Hotel Sterling. After the usual routine

business, Educational Chairman J. Downs reported that his committee has plans under consideration for a rate book revision; also sample installation layout and features for contests.

Professor McKeeman, from the Case School of Applied Science, gave an interesting talk on the history of refrigeration and a blackboard discussion of theory.

December 17—The chapter's third Christmas Frolic was held in the spacious rooms of the Russert Dining Salon. Mr. H. Spivak, chairman, and his committee, provided a full evening's entertainment, starting in with a dinner at 7 p. m. Jimmy Ague and his company of radio entertainers were engaged so many times that the program extended beyond the time originally planned. Through the courtesy of President W. E. Wright, the Rita Carr Dancing Studio put on their Miniature Review, which pleased the parents as well as the children. Flowers for the ladies, candy for the children, and door prizes were given, and the very excellent orchestra provided music for dancing.

TWIN CITIES CHAPTER

January 10—This was the annual meeting of Twin Cities chapter and in accordance with the usual practice President A. E. Johansen asked the Treasurer to present his

annual detailed report of the finances prior to turning the books over to the newly elected officers.

President Johansen announced the next order of business was the annual election and the Nominating Committee then presented their selection of officers for the coming year, and after the usual procedure of election routine, the results were as follows: *President*, Wm. V. Warner; *First Vice-president*, B. J. DeLange; *Second Vice-president*, A. O. Gartner; *Secretary*, O. Koberger; *Treasurer*, J. D. Stewart; *Sergeant-at-arms*, A. G. Larson; *Directors*: H. Schaeffer, A. M. Palen, W. E. Gleb, A. E. Johansen and L. A. Kreckow.

All officers were filled with the exception of the Educational Committee Chairman, and the selection of this position was left in the hands of the Committee.

Mr. George Helebrandt of L. Sonneborn & Sons, Inc., was scheduled to be the speaker of the evening, but since he was unable to attend, his paper was presented by Mr. S. D. Horton of the Thompson-Hayward Chemical Co. The subject of the paper was "Refrigeration Oils."

PITTSBURGH CHAPTER

January 13—During the course of the business session of the evening President E.

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V. Black appointed various committees to carry on the work of the chapter during the coming year. Correspondence for the month was read by the President, and some discussion followed.

Mr. Stephen Hleba and Mr. Albert Viola were introduced, and presented a lecture and demonstration on Wagner motors. Mr. Hleba answered any questions pertaining to the servicing of the motors asked by the members. The entire educational program was very much enjoyed by those present.

ONTARIO FOREST CITY CHAPTER

January 6—The meeting was held in the private dining room of the Hotel London, and was turned over to Mr. Ted Cropper of the Canadian National Carbon Company of Toronto, who talked on the manufacture and proper application of brushes to motors. He illustrated his talk with sound pictures showing the various processes used in the manufacture of this important motor part. A number of visitors were present from the various plants located in and around London.

January 23—The meeting was again held in the Hotel London with more than one hundred members and visitors present. The main feature of the meeting was a re-

view of the All-Industry convention just completed in Chicago and given by Mr. F. A. M. Dawson of Refrigeration Supplies Limited.

This was followed by a talk given by Mr. Hal Roffman of New York city, who is a consultant on the problems of the brewing industry. Mr. Roffman presented some very interesting information regarding this industry. Many dispensing troubles were discussed, and methods of correction suggested. It was most educational to learn how every phase of brewing processes and dispensing depend so much on proper refrigeration.

Mr. Roffman travels throughout the United States correcting troubles for breweries and has written several articles for various publications as well as addressed many conventions.

NIAGARA FRONTIER CHAPTER

January 4—This being the first meeting of the year, the main business of the evening was the election of officers. Following the usual procedure of such elections, the election took place with the following results: *President*, G. O'Hara, Jr.; *First Vice-president*, Fred Cameron; *Second Vice-president*, M. R. Harrison; *Secretary*, Stanley Szyszkowski; *Treasurer*, Richard Townsend; *Sergeant-at-arms*, Howard Hornung;

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Directors: W. Frier, E. Wiese, Ray Henke, G. Wilson; *Educational Committee Chairman,* R. D. Davis.

Installation of officers was not made at that time, but it was announced that they would assume their duties on February 1st.

In the meantime, it was suggested that the books be audited and that all business for the past year be completed in order that a clean slate may be presented to the new officers in accepting their respective chairs.

TOLEDO CHAPTER

January 10—After the minutes of the previous meeting had been read and the business of the evening completed, President A. J. King gave a complete resumé of his year.

Chairman of the Educational Committee, R. E. Dunlap, gave a complete report of the progress made on the city code and stated that the code should be ready for its first reading in the near future.

Election of officers took place, with these results: *President,* H. C. Benington; *Vice-president,* D. J. McGinley; *Secretary-Treasurer,* C. N. Bordner; *Sergeant-at-arms,* P. D. Sizer; *Directors:* H. C. Benington, D. J. McGinley, C. N. Bordner, F. A. Rudolph, E. M. Gresham, A. J. King.

Thanks were extended to the retiring officers for their efforts in the past year and

the new officers were installed in their respective chairs.

January 24—The chapter had its regular business meeting at Battelle Memorial Institute. After the meeting Mr. Jackson gave a lecture on the character of magnetism of metals and alloys in reference to temperature, which was very interesting. The members were then shown through the institute, a trip which was enjoyed by all.

LONG BEACH CHAPTER

January 27—The meeting was called to order by President E. B. Gunsauls. Due to the Secretary's absence, Mr. J. H. Engel acted in his place.

A discussion followed regarding the new proposed city ordinance which is being composed for the purpose of regulating the installation and servicing of refrigeration equipment in the city.

A report of the status of the treasury was read by Treasurer Willis, and Mr. Willis also offered the use of his place of business for future meetings.

Both the reports and the invitation were accepted by the meeting.

Mr. R. L. Darby was elected chairman of the Publicity Committee, and Mr. Vogel was elected chairman of the Educational Committee.

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LAST fall, during the critical days in Czechoslovakia, men from every industry mobilized to contribute their share to the defense of their country when required. Naturally, refrigeration would play an important part in any eventuality.

The photograph shows part of the organization of Mr. Joseph Horak, one of the large refrigeration contractors in Czechoslovakia,

which answered the call to the colors. Thirty-four men were called from this organization. In the picture, also, can be seen a protection, which was erected by the Horak organization, to provide shelter against any bombing by planes.

Mr. Horak is well-known among many organizations in the United States, as he frequently visits this country to secure first-hand information on current refrigeration developments, and also secured his early training in refrigeration work in the United States.

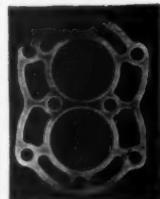
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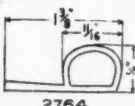
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February, 1939

PITTSBURGH LADIES' AUXILIARY

THE meeting was held at Gammon's Restaurant on Friday evening, January 18th. Due to weather conditions, the attendance was rather poor. After the gossip of the evening had been dispensed with, the meeting came to the conclusion that a dinner and theatre party should be held on January 18th.

Entertainment consisted of card games and exchanging of Christmas gifts and the partaking of a well-served lunch.

TRI-STATE CHAPTER AND LADIES' AUXILIARY CHRISTMAS PARTY

THE Ladies Auxiliary and Tri-State Chapter had a joint Christmas party at the home of Mr. and Mrs. M. E. Harrison December 27th, 1938. Bingo and Hop Ching were played during the evening.

To celebrate the election of Mr. and Mrs. Claude Brunton as National Presidents of the Society and Ladies' Auxiliary and to show their appreciation of the unselfish service rendered by them for the advancement of both the National Society and Tri-State Chapter, the members of the Ladies' Auxiliary and Tri-State Chapter presented Mr. and Mrs. (Claude and June) Brunton with a silver coffee service.

Refreshments were served by the hostess assisted by the ladies of the Auxiliary.

TRI-STATE LADIES AUXILIARY

A REGULAR meeting of the Auxiliary was held at the home of Mrs. R. McElhane in Huntington, W. Va., on January 9th. The meeting was presided over by the President, Mrs. C. A. Brunton.

After the business was dispensed with, the big discussion of the evening was a pot luck dinner to be held soon for the men.

Games were played and refreshments served by the hostess of the evening. Then Mrs. McElhane called the men and told them she had refreshments for them and that they were to join the ladies after their meeting, to which they joyfully responded.

The meeting of January 23rd was held at Portsmouth, Ohio, at Mrs. F. Poole's home and was called to order by President Mrs. C. A. Brunton. A new member, Mrs. J.

smoot of Huntington, W. Va., was admitted to the Auxiliary.

After the business session the menu for the dinner to be held at the home of Mr. and Mrs. A. W. Gruber of Ironton, Ohio, was read and approved.

Refreshments were served by the hostess of the evening to both the Ladies Auxiliary and the men, who joined them later.

The dinner at Mr. and Mrs. Gruber's home is for all members and their wives of the Tri-State Chapter.

SECOND EDITION OF "ANSUL REFRIGERANTS" READY

THE second edition of "Ansul Refrigerants," revised, brought up to date, and enlarged to 68 pages, is now off the press and ready for distribution. With new illustrations, new charts and tables, "Ansul Refrigerants" is virtually a textbook for the refrigerating engineer.

The original edition of the book was published in 1935, in loose-leaf form, with the idea that new data or corrections could be added or substituted. However, the inception of "Ansul News Notes" as a house periodical (now in its third volume) provides an improved medium for the reporting of new information, particularly results obtained by the Ansul research staff. For this reason the second edition of "Ansul Refrigerants" is a bound-leaf booklet.

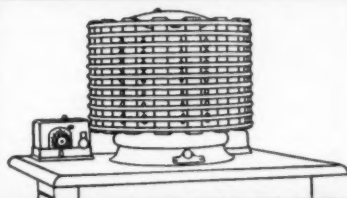
Included are such subjects as complete data on sulphur dioxide and methyl chloride, comparison of refrigerants, practical use of tables and charts, lubrication, handling refrigerants, measuring charge, methods of temperature control, compressor data, suction-line pressure drop, Ansul cylinder sizes, valves, and equipment, I. C. C. regulations, conversion tables, formulas, and an extensive dictionary of refrigeration terms.

A. B. SCHELLENBERG ELECTED PRESIDENT OF ALCO VALVE CO.

A. B. SCHELLENBERG, formerly Vice-President of the Alco Valve Company, was elected President and General Manager at a meeting of the Board of Directors January 30th. Mr. Schellenberg succeeds J. L. Shrode, founder and president of Alco, who died suddenly December 31st.

Mr. Schellenberg has been Sales Manager of the company for the past two years.

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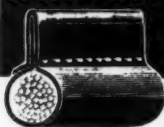
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After receiving his degree in Chemical Engineering from Washington University, he worked for a time in the Service Department of the local Kelvinator distributor. He joined the Alco Valve Company in 1929, four years after its founding, and worked first in the Engineering Department and later in the Sales Department. When he first started with Alco, the Company only manufactured a constant pressure expansion valve and a thermo expansion for ammonia only, and several magnetic valves. The Alco thermo-

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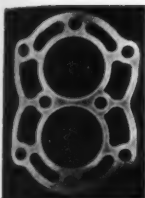
static expansion valve was one of the first to be built commercially. These early thermo valves were elaborate and expensive devices which included a gauge, a charging valve, and a large remote bulb section which became part of the suction line. These early valves were charged on the job with some of the refrigerant in the system. The company now has a complete line of expansion valves for low pressure refrigerants as well as ammonia, float switches, float valves, multi-outlet valves and magnetic valves.



A. B. SCHELLENBERG

In 1932 Schellenberg was made Manager of Alco's New York office and continued in that capacity until January, 1937, when he returned to St. Louis as Company Sales Manager.

During the past two years Schellenberg has lectured on Refrigerant Control in over 50 cities in the United States and Canada. He has addressed meetings of the A. S. R. E., R. S. E. S., N. A. P. R. E., several of the National Food Preservation Conferences, and classes of many Engineering Schools.



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Mr. Schellenberg has announced that John E. Dube, formerly with the Fulton Sylphon Company, has joined the Alco Engineering Department to direct its new development program. For the past five years Mr. Dube has been in charge of the design and development work at the Fulton Sylphon Company in Knoxville.

HAYNES, NEW MARLO PACIFIC COAST REPRESENTATIVE

MERLE G. HAYNES has been appointed Pacific Coast representative for the Marlo Coil Company of St. Louis, Missouri. Mr. Haynes will make his headquarters at 703 Market Street, San Francisco, Calif.

CORRECTION REGARDING SPANGLER CO. PURCHASE

IN the December issue, a news item carried the report of the sale of the Spangler Co., St. Louis, to the Brass & Copper Sales Co.

The heading of this item indicates that the name was purchased. However as the text of the article correctly states, the name was not included in the sale.

SERVICE CONTRACTORS ELECT NEW OFFICERS

AT the annual meeting of the Refrigeration Service Contractors Association of Chicago, held January 23, an election of officers for the coming year resulted in the reelection of Mr. Geo. Monjian as *president*, and Mr. Oscar Heide as *vice-president*. New

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officers elected were Mr. Fred Twiss, *secretary*, and Mr. Fred Roth, *treasurer*.

Board of Directors: Messrs. John Jennings, A. Well, T. Johnson and Ogden Armstrong.

It is interesting to note that nearly all the members of the Contractors Association are also members of the Refrigeration Service Engineers Society.

Classified Ads

Rate: Two Dollars for fifty words or less. 30 cents for each additional ten words or less.

POSITION WANTED—Serviceman, age 26, single. Six years experience commercial and domestic service and installation. Some ammonia and air conditioning. Have car. Will go anywhere on five days' notice. References. Address Box 316, Victorville, California.

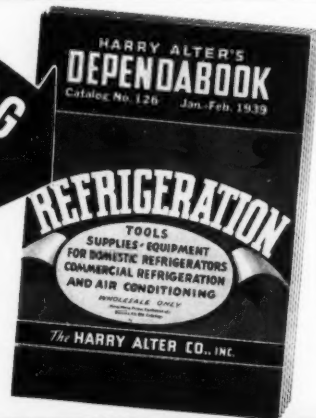
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Index to Advertisements

Airco Refrigeration Parts.....	61	Jarrow Products Corp.	58
Airo Supply Co.	61	Kerotest Manufacturing Co.	40 and 41
Alco Valve Co.	00	Maguire Co., Wm. F.	57
Alter Co., The Harry.....	62	Manufacturers Fin Coil Co.	56
Aluminum Ore Co.	4	Marlo Coil Co.	45
Ansul Chemical Co.	43	Marsh Corp., James P.	51
Automatic Heating & Cooling Supply Co.	53	Mills Novelty Co.	42
Automatic Products Co.	7	Modern Equipment Corp.	5
Blythe Co., H. W.	60	Mueller Brass Co.	48
Bonney Forge & Tool Wks.....	Back Cover	New Duty	58
Channon Co., H.	60	Peerless of America, Inc.	1
Chicago Eye Shield Co.	55	Penn Electric Switch Co.	2 and 3
Chicago-Wilcox Mfg. Co.	57	Practical Instrument Co.	47
Commercial Coil & Refrigeration Co.	59	Ranco, Inc.	8
Complete Electric Supply Co.	59	R. & H. Chemicals Dept.	46
Cook Co., The	60	Refrigeration Service, Inc.	58
Dennis & Co., W. J.	60	Refrigeration Supplies Co., Ltd.	58
Detroit Lubricator Co.	10	Remme Co.	57
Electrimatic Corp., The.....	00	Rex Refrigeration Service, Inc.	56
Fedders Manufacturing Co.	32 and 33	Rotary Seal Co.	Inside Front Cover
Flushing Refrigeration Co.	53	Snap-on Tools Corp.	44
General Controls	55	Syntron Co.	64
General Electric Co.	6	Tecumseh Products Co.	64
General Electrical Refrigerator Service.....	59	Trenton Auto Radiator Works.....	49
Gilmer Co., L. H.	00	Utilities Engineering Institute	54
Goldberg Co., Herman.....	00	Virginia Smelting Co.	63
Hammond Drierite Co., W. A.	54	Wants, etc.	61
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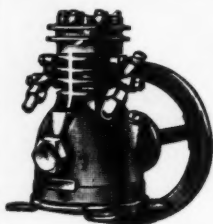
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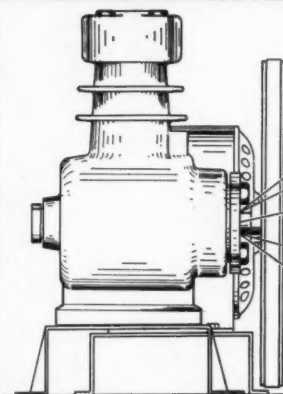
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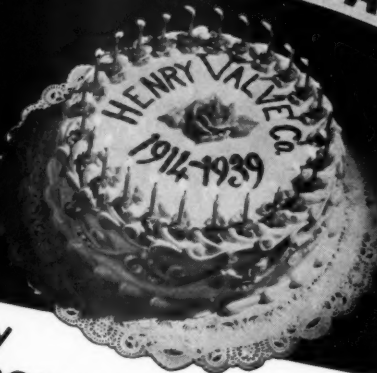


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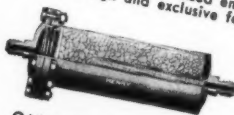
HENRY THE PRODUCT OF EXPERIENCE

This year we celebrate our silver anniversary, and to the industry we serve, our gratitude is extended for the support and confidence that have enabled us to reach this period of growth.

Interwoven with the destiny of every company that has survived a quarter of a century, there is a policy — a guiding principle whereby the shuttling threads of a business enterprise are joined into a fabric of enduring worth. From the beginning, our policy has been to bring you products embodying the most advanced engineering design and exclusive fea-

tures of construction. The merits of this policy have been proved with the years. Value rarely goes unrecognized, and thanks to your response, the Henry line today is the most complete of its kind in refrigeration and air conditioning.

But, having reached a quarter-century mark, we are not inclined to rest on past-won laurels. Therefore we reaffirm our pledge that in the coming years we constantly shall strive to design and manufacture products which, because of their superior value, can always be relied upon to bring you added sales and profits.



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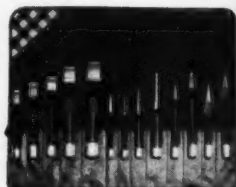
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